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Attorneys for Defendant Mountain Cement Company

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF WYOMING**

Biodiversity Conservation Alliance and Sierra Club,	)	
Plaintiffs,	)	Case No. 04CV 361-B
v.	)	
Mountain Cement Company,	)	
Defendant.	)	

DEFENDANT'S PRETRIAL MEMORANDUM

Defendant Mountain Cement Company ("Mountain Cement") files this Pretrial Memorandum in accordance with the Court's Order on Initial Pretrial Conference and Local Rule 16.2(b).

I.
JURISDICTION AND PARTIES

The parties in this case are Plaintiffs, Biodiversity Conservation Associates and Sierra Club, and Defendant Mountain Cement. The Court has personal jurisdiction over all parties in this case, but Plaintiffs have not established that they have standing.

Mountain Cement asserts that the Court does not have subject matter jurisdiction over the Plaintiffs' claims because (1) Plaintiffs did not provide adequate notice of their claims under 42 U.S.C. § 7604(b)(1)(A) and (2) the state of Wyoming had commenced and was diligently prosecuting an enforcement action against Mountain Cement concerning alleged opacity violations at the time this lawsuit was filed. 42 U.S.C. § 7604(b)(1)(B).

II.
THE PARTIES' POSITIONS AND LEGAL THEORIES

Mountain Cement owns a cement plant located just outside of Laramie, Wyoming that has been operating under two successive operating permits issued by the Wyoming Department of Environmental Quality (the "DEQ"). Among other things, these operating permits limit the opacity of emissions and the amount of particulate matter that can be emitted from the plant.

Plaintiffs Biodiversity Conservation Alliance and Sierra Club (collectively referred to as "Biodiversity") allege that Mountain Cement has violated these permits by periodically exceeding the opacity limits and particulate matter limits at Kiln #2, and the opacity limits at the clinker coolers of the plant. According to Biodiversity, there was a permit violation for each six-minute interval in which Mountain Cement's continuous opacity monitoring system ("COMS") measured an average opacity in excess of 20% for Kiln #2 and 10% for the clinker coolers. Although Biodiversity's original claim included periods of startup and shutdown, Biodiversity has now conceded that the opacity and particulate matter limits do not apply during periods of

startup or shutdown. Additionally, Biodiversity concedes that its claims do not include any opacity exceedances greater than 5% in any quarter or greater than 3% in two consecutive quarters. Biodiversity seeks civil penalties for Mountain Cement's alleged permit violations and injunctive relief in the form of an order requiring Mountain Cement to install a baghouse to attempt to provide additional control of particulate matter emissions from Kiln #2.

Mountain Cement acknowledges that there have been opacity exceedances during the time period at issue in this case, but asserts that almost all of them occurred during periods of startup, shutdown or malfunction. The opacity and particulate matter limits in Mountain Cement's permits do not apply during periods of startup, shutdown or malfunction. As a consequence, the vast majority of exceedances at issue in this case cannot constitute permit violations.

The DEQ, which issued and is responsible for monitoring compliance with Mountain Cement's permits, has a long-standing enforcement policy stating that it will not take any enforcement action for exceedances violations of opacity standards as determined by COMS data unless the exceedances occur more than 5% of the operating time in any given quarter, or more than 3% of the operating time in two consecutive quarters (the "Safe Harbor"). This Safe Harbor policy, which is uniformly applied to all permittees, is based on and consistent with a federal enforcement policy of the EPA for major facilities. With the exception of five quarters in 2001 and 2002, opacity of emissions from Kiln #2 was within the Safe Harbor for every quarter addressed by this lawsuit. As a consequence, there could be no permit violations for any periods other than five quarters in 2001 and 2002.

The DEQ filed an enforcement action against Mountain Cement prior to the filing of this lawsuit that, among other things, specifically addressed the opacity exceedances in the five quarters of 2001 and 2002 in which opacity of emissions from Kiln #2 exceeded the Safe Harbor.

That enforcement action concluded with the issuance of a Consent Decree directing Mountain Cement to pay certain civil penalties for alleged violations during that time period.

According to 42 U.S.C. § 7604(b), Biodiversity cannot properly maintain this action because the DEQ was diligently prosecuting these claims against Mountain Cement at the time this lawsuit was filed. Further, the claims in this lawsuit were actually brought or, at the very least, could have been brought in the DEQ enforcement action. As a consequence, the Consent Decree in that action constitutes a final judgment that bars Biodiversity's present claims under the doctrine of *res judicata.*

Mountain Cement asserts that Biodiversity does not have standing to maintain this case, because its member representatives cannot establish that they have suffered any injuries-in-fact that were caused by any alleged violations of Mountain Cement.

Mountain Cement also asserts that Biodiversity has failed to provide pre-suit notice of the number of alleged violations and the dates of the alleged violations pursuant to 42 U.S.C. § 7604(b).

III.
WITNESSES

A. Persons Who Will Testify

Mountain Cement will call the following witnesses at the trial of this case:

Stuart Tomlinson
Mountain Cement Company
5 Sandcreek Road
Laramie, Wyoming 82070
307-745-4879

Mr. Tomlinson is expected to testify about how Mountain Cement's Laramie plant operates, as well as the relationship between Mountain Cement and Eagle Materials.

Mike Meysing
Mountain Cement Company

5 Sandcreek Road
Laramie, Wyoming 82070
307-745-4879

Mr. Meysing is expected to testify about operational issues related to the plant, plant maintenance, malfunctions, environmental issues associated with the plant, and Mountain Cement's dealings with the DEQ.

Dan Olson, Administrator
Wyoming Department of Environmental Quality
Division of Air Quality
122 West 25th Street, Herschler Building
Cheyenne, Wyoming 82002
307-777-7391

Mr. Olson is expected to testify concerning the state's enforcement policies related to opacity and particulate matter, and the state's most recent notice of violation and enforcement action filed against Mountain Cement, and its resolution. The substance of Mr. Olson's testimony is generally set forth in his affidavit, a copy of which is attached to and incorporated by reference in this Pretrial Memorandum as Exhibit A.

Thomas R. Keeler
TRK Engineering Services, Inc.
95 Clarks Farm Road
Carlisle, MA 01741
978-287-0550

Mr. Keeler is expected to testify as an expert witness. His qualifications, opinions and conclusions are set forth in his report, a copy of which is attached to and incorporated by reference in this Pretrial Memorandum as Exhibit B.

Ralph L. Roberson
RMB Consulting & Research, Inc.
5104 Bur Oak Circle
Raleigh, NC 27612
919-510-0376

Mr. Roberson is expected to testify as an expert witness. His qualifications, opinions and conclusions are set forth in his report, a copy of which is attached to and incorporated by reference in this Pretrial Memorandum as Exhibit C.

Roger Brower
Zephyr Environmental Corp.
5300 Dorsey Hall Drive, Suite 200
Ellicott City, MD 21042
410-312-7907

Mr. Brower is expected to testify as an expert witness. His qualifications, opinions and conclusions are set forth in his report, a copy of which is attached to and incorporated by reference in this Pretrial Memorandum as Exhibit D.

Dale Jensen
PriceWaterhouse Coopers, LLP
1670 Broadway, Suite 1000
Denver, CO 80202
720-931-7343

Mr. Jensen is expected to testify as an expert witness. His qualifications, opinions and conclusions are set forth in his report, a copy of which is attached to and incorporated by reference in this Pretrial Memorandum as Exhibit E.

B. Persons Who May Testify

In addition to the above witnesses that Mountain Cement will call at trial, Mountain Cement may call the following witnesses:

William Sansing, Ph.D.
Mountain Cement Company
5 Sandcreek Road
Laramie, Wyoming 82070
307-745-4879

Dr. Sansing is the environmental manager at the plant. Dr. Sansing is expected to testify generally as set forth in his affidavit, a copy of which is attached to and incorporated by reference in this Pretrial Memorandum as Exhibit F. Dr. Sansing is also expected to prove up

various exhibits, if necessary, as a custodian of records for Mountain Cement.

Frank Plumber
Foreman
Ashgrove Cement Company
Arkansas
870-542-3280 (direct)
870-542-6217 (main line)

Mr. Plumber may be called to testify about his personal knowledge concerning State of Wyoming Department of Environmental Quality, Air Quality Division, Notice of Violation, Docket No. 2751-96, issued on June 5, 1996. If called, he is expected to testify that the No. 1 Kiln ESP was rebuilt incident to returning Kiln No. 1 to production. The ESP operated properly for three days, and then began malfunction. The Kiln was operated at a reduced capacity during the 90-day startup period in an effort to diagnose the ESP malfunction. Mountain Cement evaluated repairing the ESP, retrofitting the ESP with baghouse components, and installing a new baghouse. Mountain Cement made an internal decision to replace the collector plates in the ESP housing with baghouse components after evaluating the cost to repair the ESP and the unexpected dust loading of kiln gases passing through the No. 1 Kiln. DEQ-AQD issued a Notice of Violation and Order on June 5, 1996, requiring that Mountain Cement explore and implement improvements to the Kiln No. 1 ESP in order to achieve compliance with its Operating Permit. On July 21, 1996, Mountain Cement advised DEQ that it was electing to retrofit the ESP with a jet pulse baghouse. After Mountain Cement advised DEQ-AQD of its decision to retrofit its ESP with jet pulse baghouse components, DEQ-AQD issued a Compliance Order on July 6, 1996, requiring that Mountain Cement develop a compliance plan for converting its No. Kiln 1 ESP to a baghouse, and directing that the Kiln be shut down no later than December 27, 1996, to complete the conversion. It was later determined that the ESP components were installed incorrectly and that the internal collecting plates were damaged

during startup. Mountain Cement was advised that the ESP could be repaired and that it would work correctly, but the decision had already been made to convert the ESP to a baghouse. The matter was finally resolved through *People of the State of Wyoming v. Mountain Cement,* filed as Civil Action 26454, in the Second Judicial District Court, Albany County, State of Wyoming.

Rick Wilson
Acting Production Manager
Production Foreman
Mountain Cement
5 Sandcreek Road
Laramie, Wyoming 82070
307-745-4879

Mr. Wilson may provide testimony concerning various issues related to the history of the Plant, including but not limited to emission control issues and dealings with state and federal regulators.

Bob Kersey, Chief Chemist
Mountain Cement
5 Sandcreek Road
Laramie, Wyoming 82070
307-745-4879

Mr. Kersey may testify concerning various matters related to raw feed rates and raw materials used at the Plant.

Robert P. Gill
Air Qualify Division Compliance Program Manager
Department of Environmental Quality
Division of Air Quality
122 West 25th Street, Herschler Building
Cheyenne, Wyoming 82002
307-777-7391

Mr. Gill may provide testimony concerning Mountain Cement's air permits, the Wyoming Air Quality Program, and the issuance and resolution of notices of violation issued to Mountain Cement by state authorities.

Michael D. Seaton
Mountain Cement
5 Sandcreek Road
Laramie, Wyoming 82070
307-745-4879

Mr. Seaton may be called to testify on issues related to alleged injury-in-fact for Biodiversity's standing claims. If called, Mr. Seaton will testify as set forth in his declaration, a copy of which is attached to and incorporated by reference in this Pretrial Memorandum as Exhibit F.

Philip A. Nicholas
Anthony, Nicholas, Tangeman & Yates, LLC
170 N. Fifth Street
P.O. Box 0928
Laramie, WY 82073
(307) 742-7140

Mr. Nicholas may testify as an expert witness concerning the reasonableness of any attorneys' fees sought by Biodiversity.

Sam Trautman
556 N. 10^{th} Street
Laramie, WY 82072

Unless otherwise agreed upon by the parties, Mr. Trautman may be called solely as a foundation witness in regard to Mountain Cement Company's demonstrative exhibits. Specifically, Mr. Trautman is a videographer and photographer who has taken video/pictures of the cement plant.

IV.
EXHIBITS

Mountain Cement intends to offer the following exhibits at trial in this case:

A. Permit No. 30-098

B. Permit No. 31-098

C. Excerpts from Mountain Cement's Quarterly Excess Emission Reports from 4th Quarter of 1999 through 1st Quarter of 2005.

D. DEQ's Notice of Violation dated September 3, 2002

E. December 18, 2002 letter to Glenn Spangler from Bruce Ballinger

F. Summary of Excess Opacity at Clinker Coolers (Attachment 2 to Sansing Affidavit)

G. Expert Witness Report of Thomas R. Keeler, TRK Engineering Services, Inc.

H. Summary of Quarterly Excess Opacity Reports (Attachment #1 to Keeler Report)

I. Pages from Chapter 5, National Emission Standards, Wyoming Air Quality Standards and Regulations (Attachment #2 to Keeler Report)

J. Appendix A, EPA Manual ESP Applications in the Cement Industry (Attachment #3 to Keeler Report)

K. Summary of Average Hourly Opacity > 20% (Attachment #4 to Keeler Report)

L. Resume for Thomas Keeler (Attachment #5 to Keeler Report)

M. Expert Report of Roger Brower on Behalf of Defendant

N. Results of Searching U.S. EPA's RACT/BACT/LAER Clearinghouse database for permitting /PSD/BACT decisions relating to Portland cement kilns using ESPs for particulate matter control (Attachment A to Brower Report)

O. Florida Rock Industries draft permit no. 0010087-013-AC, PSD-FL-350 (Attachment B to Brower Report)

P. Best Available Control Technology Determination (BACT), Florida Rock Industries, Inc. Newberry Plant, PSD-FL-350, Air Permit 0010087-013-AC, Alachua County, Page BD-15 (Attachment C to Brower Report).

Q. Listing of stack test reports (Attachment D to Brower Report)

R. Results from stack tests on September 3, 2004 and November 25, 2003 (Attachment E to Brower Report)

S. U.S. EPA Green Book (attainment status) for Wyoming particulate matter attainment status (Attachment F to Brower Report)

T. Summary of PM_{10} ambient monitoring in Laramie, Wyoming for 1999 through 2004 (Attachment G to Brower Report)

U. U.S. EPA Air Quality System Report for 2002 for Site ID 56-001-0801 (Attachment H to Brower Report)

V. WDEQ Air Quality Division Facility Inspection Report — FY 2004 for Mountain Cement Company (September 13, 2004 inspection) (Attachment I to Brower Report)

W. U.S. EPA memo entitled "Areas Affected by PM-10 Natural Events (Attachment J to Brower Report)

X. Mountain Cement Company's Fourth Quarter, 2002 Excess Emissions Report, Kiln #2 Form C, page 8 (Attachment K to Brower Report)

Y. Mountain Cement Company's Third Quarter, 2002 Excess Emissions Report, Kiln #2 Form C, pages 3-4 (Attachment L to Brower Report)

Z. U.S. EPA Air Quality System Report for 2002 for Site IDs 56-001-0801 and 56-001-0800 (Attachment M to Brower Report)

AA. Resume of Roger Brower and references of authored/co-authored technical papers (Attachments N and O to Brower Report)

BB. Expert Report of Ralph L. Roberson

CC. Frequency Distribution of Opacity Data (Appendix A to Roberson Report)

DD. Resume of Ralph L. Roberson

EE. Expert Report of Dale R. Jensen, CPA

FF. Calculations for BEN Model (Attachment B to Jensen Report)

GG. Resume of Dale R. Jensen (Attachment C to Jensen Report)

HH. Results of Method 5 particulate matter monitoring tests for Mountain Cement's plant

II. Notice letter from Biodiversity dated October 23, 2004

JJ. Complaint filed by the DEQ in Wyoming State Court on December 17, 2004

KK. Consent Decree entered in the DEQ action on March 21, 2005

LL. Photos of the Plant

MM. Documents related to installation of baghouse

NN. Provisions concerning opacity and particulate matter limits (Tab A in Mountain Cement's summary judgment notebook)

OO. Provisions concerning testing to determine if violations exist (Tab B in Mountain Cement's summary judgment notebook)

PP. Provisions concerning monitoring for compliance with limits (Tab C in Mountain Cement's summary judgment notebook)

QQ. Startup, Shutdown and Malfunction Provisions (Tab D in Mountain Cement's summary judgment notebook)

RR. Summary of Kiln 2 alleged opacity exceedances (Tab G in Mountain Cement's summary judgment notebook)

SS. Summary of Clinker Cooler alleged opacity exceedances (Tab H in Mountain Cement's summary judgment notebook)

TT. Summary of opacity exceedances

UU. Diagrams showing the layout of the plant

VV. Sheets identifying the causes and corrective actions for malfunctions.

WW. Graphics from EPA website showing air quality in Laramie and Albany County, Wyoming

In addition to the foregoing exhibits, Mountain Cement may offer additional exhibits for demonstrative purposes, many of which are still in the process of being prepared. Mountain Cement reserves the right to offer or otherwise use any exhibits listed by Biodiversity. Mountain Cement also reserves the right to offer any other exhibits for rebuttal purposes.

V.
UNCONTROVERTED FACTS

Mountain Cement believes that the following facts in this case are not in dispute:

1. Mountain Cement owns and operates a 2-Kiln cement plant outside of Laramie, Wyoming.

2. Among the stacks authorized to release particulate matter at that plant is one associated with Kiln #2 (the "Kiln #2 Stack") and another stack associated with the clinker coolers for clinker produced by both kilns (the "Clinker Cooler Stack").

3. From June 2, 1999 through March 14, 2004, emissions from the Plant were subject to Operating Permit No. 30-098.

4. The source of the opacity limit in Operating Permit No. 30-098 is the New Source Performance Standards (NSPS).

5. Operating Permit No. 30-098 incorporates WAQSR, Chapter 5, § 2(i)(iii) of the NSPS.

6. WAQSR, Chapter 5, § 2(i)(iii) of the NSPS states as follows: "Compliance with the Opacity Standards in this part shall apply at all times except during periods of startup, shutdown, or malfunction, and as otherwise provided in the applicable standard."

7. From March 15, 2004 to the present, emissions from the Plant have been subject to Operating Permit No. 31-098.

8. The source of the opacity limit in Operating Permit No. 31-098 is the National Emission Standards for Hazardous Air Pollutants (NESHAPS).

9. Operating Permit No. 31-098 incorporates WAQSR, Chapter 5, § 3(h)(vii)(A) of the NESHAPS.

10. WAQSR, Chapter 5, § 3(h)(vii)(A) of the NESHAPS states as follows: "The opacity and visible emission standards set forth in this section shall apply at all times except during periods of startup, shutdown, and malfunctions, and as otherwise specified in the applicable subpart."

11. Operating Permit No. 30-098 and Operating Permit No. 31-098 both require Mountain Cement to submit quarterly excess emission reports to the DEQ that identify "each

period of excess emissions that occurs during startups, shutdowns, or malfunctions of Kilns No. 1 and No. 2, the nature and cause of any malfunction, and the corrective action taken or preventative measures adopted."

12. At all times relevant to this lawsuit, Mountain Cement has identified in its quarterly excess emission reports each period of excess emissions that occurred during startups, shutdowns or malfunctions of Kiln #2, the nature and cause of the malfunctions, and the corrective actions taken or preventative measures adopted.

13. There are two methods recognized by EPA for measuring opacity: (1) Method 9, involving a trained observer, and (2) a continuous opacity monitoring system ("COMS") involving the use of a mechanical device attached inside of a stack.

14. Operating Permit No. 30-098 incorporates WAQSR Chapter 5 § 2.

15. The COMS method, unlike Method 9, is a continuous monitoring method.

16. It is and has been the practice of the DEQ since 1999 that it will not take any enforcement action for opacity exceedances measured by a COMS as long as the exceedances occur less than 5% of the operating time in any one quarter and less than 3% of the operating time in two consecutive quarters (the "Safe Harbor").

17. The opacity limits set forth in Mountain Cement's operating permits do not apply during periods of startup or shutdown.

18. Biodiversity's claims do not include opacity exceedances occurring more than 5% of the time in any quarter or more than 3% of the time in any two consecutive quarters.

19. The source of the particulate matter limits for Kiln #2 in Operating Permit No. 30-098 is the NSPS.

20. Operating Permit No. 30-098 incorporates WAQSR, Chapter 5 § 2(h)(iii).

21. WAQSR, Chapter 5 § 2(h)(iii) states as follows: "Operations during periods of startup, shutdown, and malfunction shall not constitute representative conditions for the purpose of a performance test, nor shall emissions in excess of the applicable emissions limit during periods of startup, shutdown, and malfunction be considered a violation of the applicable emissions limit, unless otherwise specified in the applicable standard."

22. The source of the particulate matter limits for Kiln #2 in Operating Permit No. 31-098 is the NESHAPS.

23. Operating Permit No. 31-098 incorporates WAQSR, Chapter 5 § 3(h)(v)(A) and (h)(vii)(A).

24. WAQSR, Chapter 5 § 3(h)(v)(A) and (h) (vii) (A) state as follows: "The non-opacity emission standards set forth in this part shall apply at all times except during periods of startup, shutdown and malfunction, and as otherwise specified in an applicable subpart."

25. The particulate matter limits set forth in Mountain Cement's operating permits do not apply during periods of startup or shutdown.

26. In determining whether an emission source is in compliance with the particulate matter standards, the DEQ uses a test called the Method 5 test.

27. Method 5 requires taking representative samples of stack gases over three sampling runs of at least an hour in length, weighing the dust captured in each sampling run, then converting that amount to a pounds-per-hour figure based upon the measured volume of the stack gases that are released during the sampling run. If the average pounds per-hour-figure of the three runs is higher that the permit limit, then a violation exists.

28. Method 5 tests at the plant have not shown an exceedance of permit limits.

29. On October 22, 2004, Biodiversity sent a letter to Mountain Cement, and to state and federal authorities, alleging that Mountain Cement violated certain emission standards set forth in its operating permits.

30. On December 17, 2004, the state of Wyoming sued Mountain Cement alleging exceedances of certain operating permit limits.

31. On December 23, 2004, Biodiversity filed this lawsuit against Mountain Cement, alleging exceedances of certain operating permit limits.

32. The enforcement lawsuit filed by the state of Wyoming on December 17, 2004 was resolved through a Consent Decree entered on March 21, 2005.

33. For decades, there has been comprehensive monitoring of air quality in the vicinity of the plant for particulate matter.

34. From October 1, 1999 through December 31, 2004, the air quality of Laramie and Albany County, Wyoming has satisfied the National Ambient Air Quality Standards for Particulate Matter every day except one (December 16, 2002).

VI.
CONTESTED ISSUES OF FACT

Mountain Cement believes that the following issues of fact are contested:

1. Whether Plaintiffs have suffered an injury-in-fact due to any alleged illegal conduct of Mountain Cement that is redressable by the Court, sufficient to confer standing to maintain this action.

2. Whether certain opacity exceedances reported by Mountain Cement were due to malfunctions.

3. Whether, as a continuous monitoring method, COMS data, if used to determine compliance with opacity standards, will result in more stringent opacity standards.

4. The proper amount, if any, of any penalty that would be imposed for any alleged past opacity or particulate matter violations of the Operating Permits.

VII.
CONTESTED ISSUES OF LAW

Mountain Cement believes that the following are contested issues of law in this case:

1. Whether Biodiversity has standing to maintain this action under Article III of the U.S. Constitution.

2. Whether the operating permit limits on opacity and particulate matter are applicable during periods of malfunction.

3. Whether Mountain Cement is required to provide notice to the Wyoming DEQ-HQD within 24 hours of a malfunction in order to have any opacity or particulate matter exceedance excused.

4. Whether, under Operating Permit No. 30-098, compliance with the opacity standard for the Kiln #2 stack and the Clinker Cooler Stack can be established solely by COMS data.

5. Whether Mountain Cement is entitled to rely on the Safe Harbor on opacity exceedances established by the DEQ.

6. Whether both operating permits require that compliance with the particulate matter standard be determined solely by an EPA Method 5 stack test.

7. Whether COMS can be used to measure the mass emission rate of particulate matter and stack gases.

8. Whether the CAM Plan in Operating Permit No. 31-098 also applies to Operating Permit No. 30-098.

9. Whether Biodiversity's October 22, 2004 letter is adequate to confer subject-matter jurisdiction on this Court under 42 U.S.C. § 7604(b)(1)(A).

10. Whether the DEQ's state enforcement action against Mountain Cement, pending at the time this lawsuit was filed, precludes the Court from exercising subject-matter jurisdiction over opacity claims involving the Kiln #2 Stack under 42 U.S.C. § 7604(b)(1)(B).

11. Whether the Consent Decree entered on March 21, 2005 in the state enforcement action precludes all of Biodiversity's claims involving alleged opacity violations at the Kiln #2 Stack under the doctrine of *res judicata*.

12. Whether there are any continuing violations of opacity or particulate matter limits at the Kiln #2 Stack or the Clinker Cooler Stack.

13. Whether there is a reasonable likelihood of irreparable harm related to any risk of future opacity or particulate matter violations at the Kiln #2 Stack, or risk of future opacity violations at the Clinker Cooler Stack.

14. Whether the costs to Mountain Cement of installing a baghouse at the Kiln # 2 Stack pursuant to any order for injunctive relief would outweigh any public benefits.

15. Whether entering an order requiring installation of a baghouse on the Kiln #2 Stack would redress Biodiversity's complaints.

16. Whether any civil penalties would be appropriate if the Court determines that there have been past opacity or particulate matter violations of the Operating Permits.

DATED this 7th day of October, 2005.

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Jason M. Tangeman
ANTHONY, NICHOLAS,
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Attorneys for Defendant Mountain Cement Company

CERTIFICATE OF SERVICE

I, Philip A. Nicholas, certify that a copy of the above and foregoing pleading was served on Plaintiffs by placing a copy of the same in the U.S. Mail, postage prepaid and addressed as follows on the 7th day of October, 2005:

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Attorney at Law
910 Kearney Street
Laramie, WY 82070

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Attorneys for Defendant Mountain Cement Company

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF WYOMING

Biodiversity Conservation Alliance and Sierra Club,	)	
Plaintiffs,	)	Case No. 04CV 361-B
v.	)	
Mountain Cement Company,	)	
Defendant.	)	

AFFIDAVIT OF DAN OLSON
WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

STATE OF WYOMING)
)ss.
County of Laramie)

Dan Olson, being first duly sworn, deposes and says as follows:

1. I am over the age of 21 and fully competent to make this affidavit.

2. The facts and matters stated herein are within my personal knowledge, and are true and correct.

EXHIBIT
tabbies
A

3. I am the Administrator for the Wyoming Department of Environmental Quality, Division of Air Quality (WDEQ-AQD).

4. As the Administrator of WDEQ-AQD, my duties are defined by Wyoming Statutes § 35-11-110 titled "Powers of Administrators of the Divisions."

5. I received a Bachelor of Sciences degree in Mechanical Engineering from the University of Wyoming in 1967. I then went to work for the Idaho Engineering Laboratory where I engaged in nuclear water reactor safety research. I received my Master's Degree in Mechanical Engineering from the University of Idaho in 1975. I worked at the Idaho Engineering Laboratory in Idaho for 15 years.

6. In 1982 I returned to Wyoming and began teaching physics at Laramie County Community College. I began working for DEQ in 1988. I stopped teaching at LCCC in 1996 when my state duties became too busy to continue teaching.

7. My first job with DEQ was as a compliance officer reviewing inspection reports of inspectors in the field and making recommendations to the Administrator whether or not to take enforcement action based upon those compliance reports.

8. I was promoted to Program Manager for the State of Wyoming's Title V Operating Permit Program in 1994. The Title V Operating Permit Program is a congressionally mandated program requiring all major sources of pollution to have a single operating permit addressing all of their applicable requirements.

9. Wyoming currently has approximately 160 major sources under its Title V Operating Permit Program. Those sources include refineries, large gas plants, large compressor stations, coal fired facilities and a single cement plant located south of Laramie, Wyoming.

10. In 1997 I was promoted to Administrator of WDEQ-AQD and have served in that capacity since that time. As Administrator I am responsible for all aspects of the State of Wyoming's Air Quality Program, both technical and administrative.

11. I am responsible for approving air quality permits for any kind of source receiving a permit from WDEQ-AQD.

12. I am responsible for recommending whether the State of Wyoming will take enforcement action under the Air Quality Article to the Wyoming Environmental Quality Act found at Wyoming Statutes §§ 35-11-201 to 35-11-214 (Act) and the Wyoming Air Quality Standards and Regulations promulgated by the Department of Environmental Quality (Regulations).

13. WDEQ-AQD has 59 authorized full time employees to enforce the Act and Regulations. Besides myself, the following personnel are directly responsible for overseeing different parts of Mountain Cement's operations:

District 1 Engineer, presently Glenn Spangler;
Compliance Program Manager, presently Robert P. Gill;
NSR Program Manager, presently Bernie Daily; and
Operating Permit Program Manager, presently Mike Stoll.

14. WDEQ-AQD has been regulating the Laramie cement plant now operated by Mountain Cement Company since the adoption of the Act. Several WDEQ-AQD employees are familiar with the Laramie cement plant and its operations.

15. From June 2, 1998 through March 14, 2004, Mountain Cement Company's Portland cement plant located South of Laramie, Wyoming was subject to Wyoming Air Quality Operating Permit No. 30-098.

16. From March 15, 2004 to present the cement plant has been subject to Wyoming Air Quality Operating Permit No. 31-098.

17. Mountain Cement operates two rotary cement kilns at its facility which manufacture Portland cement. Kiln #1 is a rotary cement kiln constructed in the 1920's. Kiln #2 is a more recent and larger capacity rotary kiln constructed in the 1970's. Both Kiln #1 and Kiln #2 have been modified from how they were originally constructed or operated.

18. Operating Permit No. 30-098 identifies Kiln #2 as source No. 2, and Operating Permit No. 31-098 identifies Kiln #2 as source K-401.

19. Both of Mountain Cement Company's Air Quality Operating Permits limit emissions to the atmosphere from the Kiln #2 stack and the stack for the clinker coolers.

20. Both permits specify that opacity from the Kiln #2 stack is not to exceed 20%.

21. In Operating Permit No. 30-098, that condition is found in *The Facility Specific Permit Conditions* provision F3(a), as well as in the *New Source Performance Standards Subpart F Requirements* (NSPS-F1) to the permit. (See pages 15 and 19 to that Permit.)

22. In Operating Permit No. 31-098, that condition is found in *The Facility Specific Permit Conditions* provision F3(b), as well as the *National Emission Standards for Hazardous Air Pollutants Subpart LLL Requirements* (NESHAPS Subpart LLL) section P63-LLL1 to the permit. (See pages 6 and 17 to that Permit.)

23. The sources of both conditions regulating the opacity of the discharge stack emissions in both permits are State and Federal Regulations.

24. With respect to Operating Permit No. 30-098, the relevant Federal Regulation is subpart F of 40 C.F.R., Part 60, which was incorporated into the Wyoming

Air Quality Standards and Regulations in Section 22, Subpart F. When the State of Wyoming renumbered the Wyoming Air Quality Standards and regulations, the provisions in Section 22 became Chapter 5, Section 2.

25. Subpart F incorporates Subpart A of 40 C.F.R. Part 60. The State of Wyoming has incorporated those provisions into Chapter 5, Section 2 of the Wyoming Air Quality Standards and Regulations.

26. With respect to Operating Permit 31-098, the relevant Federal Regulation is 40 C.F.R., Part 63, Subpart LLL, which has been incorporated into the Wyoming Air Quality Standards and Regulations in Chapter 5, Section 3.

27. Subpart LLL of 40 C.F.R., Part 63, incorporates a number of general provisions found in Part 63 of 40 C.F.R. into Subpart LLL. The state of Wyoming has incorporated those provisions into Chapter 5, Section 3, of the Wyoming Air Quality Standards and Regulations.

28. The purpose of the foregoing background is to make clear that the State of Wyoming intended that the opacity conditions in Operating Permits 30-098 and 31-098 be construed consistent with the regulatory provisions from which they are derived. Stated another way, the Federal Regulations described in Paragraphs 24, 25, 26, and 27 are considered to be part of the Operating Permit to which they apply.

29. It is the position of the State of Wyoming that those portions of 40 C.F.R., Part 60 that have been incorporated into the Wyoming Air Quality Standards and Regulations Chapter 5, Section 2 provide that during periods of start up, shut down, and malfunction, exceedances of the 20% discharge stack opacity standard are excused in accordance with the applicable subpart.

30. Likewise, the portions of 40 C.F.R., Part 63 that have been incorporated into the Wyoming Air Quality Standards and Regulations at Chapter 5, Section 3 provide that the exceedances of the opacity standard of Operating Permit 31-098 are excused in accordance with the applicable subpart during periods of start up, shut down, and malfunction.

31. The WDEQ-AQD does, however, review all opacity exceedance reports.

32. It is and has been a practice of WDEQ-AQD since 1999 to follow EPA's High Priority Violations policy for all major sources. Consistent with EPA's HPV practice, since 1999 so long as opacity exceedances as measured by a continuous opacity monitoring system occur less than 5% of the operating time in any one quarter and less than 3% of the operating time in two consecutive quarters, the State of Wyoming has exercised its enforcement discretion and not brought an administrative or judicial enforcement action.

33. Where opacity exceedances are greater than those thresholds it is the practice of the WDEQ-AQD to issue a Notice of Violation, to seek financial penalties, and if necessary, to obtain relief directing a permittee to come into compliance.

34. WDEQ-AQD determines compliance with particulate matter limits for Mountain Cement based on Method 5 stack sampling.

35. Between December of 1999 and the present, Kiln #2 at the Mountain Cement plant exceeded the enforcement thresholds in Paragraph 32 in five quarters. The State of Wyoming issued Notice of Violation No. 3405-02 (NOV) to Mountain Cement on September 3, 2002 to address those exceedances. During that same time period, the stack for the clinker coolers did not exceed the enforcement thresholds in Paragraph 32.

In response to that NOV, Mountain Cement was required to achieve compliance at an acceptable emission rate. After an acceptable emission rate was achieved by Mountain Cement, the State of Wyoming initiated enforcement action against Mountain Cement to address penalties for those exceedances. That enforcement action was resolved in a Consent Decree dated March 21, 2005, entered by the Second Judicial District Court, Albany County, State of Wyoming in the matter titled *People of the State of Wyoming v. Mountain Cement Company* and filed as Civil Action No. 29380 (the "Enforcement Action").

36. Consistent with its practice, WDEQ-AQD used its enforcement discretion and chose not to include in the Enforcement Action exceedances that were below EPA's HPV policy.

37. In calculating the penalty approved by the Second Judicial District Court in the Consent Order entered in the Enforcement Action, WDEQ-AQD did not factor in exceedances below EPA's HPV policy.

38. In the case of Mountain Cement's Kiln No. 2 and the stack for the clinker coolers, the WDEQ-AQD believes all exceedances requiring an enforcement action have been resolved.

39. At the time of permitting or permit modification, WDEQ-AQD determines whether additional or different pollution control devices are required in conjunction with the completion of a BACT review.

Dated this 29 day of July, 2005.

Dan Olson

State of Wyoming)
)
County of Laramie)

Subscribed and sworn before me by Dan Olson on this 29 day of July, 2005.

Witness my hand and official seal.

Donna Behounek
Notary Public

My commission expires: April 28, 2008

DONNA BEHOUNEK - NOTARY PUBLIC
COUNTY OF LARAMIE STATE OF WYOMING
MY COMMISSION EXPIRES APR. 28, 2008

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF WYOMING

Biodiversity Conservation Alliance and Sierra Club,	)	
	)	
Plaintiffs,	)	Case No. 04CV 361-B
v.	)	
Mountain Cement Company,	)	
	)	
Defendant.	)	

EXPERT WITNESS REPORT OF THOMAS R. KEELER, TRK ENGINEERING SERVICES, INC.

A. Summary of Opinions

1. Mountain Cement company has two kiln systems in operation at their Laramie WY Facility. Kiln #1 is a Long Dry Kiln that utilizes a Baghouse and Kiln #2 is a Preheater Kiln system that uses Preheater Cyclones integrated with a Raw Mill and Cooling Tower. The two Kiln systems are very different. Kiln #1 is a much simpler design that operates at a constant high temperature. The Kiln #1 system therefore should have less malfunction of the equipment and less start-up and shutdown period of the related equipment. Because of the simplicity of Kiln #1 it is my opinion that a Baghouse or an Electrostatic Precipitator that was designed properly would tend to have less excess opacity periods than similar equipment on the Kiln #2 system. Kiln #2 system is more complex because it has been designed to provide the feed material for both Kiln #1 and Kiln #2. This function alone makes Kiln #2 more complex and more likely to have startups, shutdowns and malfunction of the system's equipment. Because of theses difference and the complexity of the Kiln #2 system, the use of a baghouse on the Kiln #2 system would not have the same beneficial results as when the ESP was replaced with a baghouse on Kiln # 1 system.

2. The majority of the opacity exceedances documented over the review period were attributed to Startups, Shutdowns and/or Malfunctions (SSM) of process equipment. I reviewed the National Emissions Standards in the Wyoming Air Quality Standards and Regulations, and am familiar with the definitions of "startup", "shutdown", and "malfunction" in WASRQ Chapter 5, Sections 2 and 3. Malfunctions are defined by the State of Wyoming and the federal government as any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process

EXHIBIT
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equipment, or a process to operate in a normal or usual manner. All of the malfunctions listed on the MCC quarterly reports would be considered infrequent and none of the unknown malfunctions contributed to more than 0.08% of the total excess opacities (see attachment #1). Additionally, there was no repetitive contribution of any of the malfunction causes from quarter to quarter.

3. I prepared as Attachment #1 a table of excess opacity using data from the quarterly reports that MCC submitted to the Wyoming Department of Environmental Quality covering periods from December 23, 1999 through the fourth quarter of 2004 (the review period). Of the 1,300.3 hours of excess opacity during the review period, it is my opinion that 97.5 percent of the excess opacity periods, or 1,268.3 hours (or 12,683 six-minute periods) are identified as being caused by startup, shutdown, malfunction or other excused causes. The 2.5 percent of excess opacity periods for Kiln #2 that are identified as unknown causes represent only 32.0 hours (or 320-six-minute periods) of excess opacity from December 23, 1999 through fourth quarter 2004.

4. I have reviewed the chart of excess opacity at MCC that is identified as Exhibit J to Plaintiffs' Motion for Partial Summary Judgment to Establish Defendant's Liability for Opacity Violations. Exhibit J reports there were 15, 480 six-minute periods of excess opacity from Kiln 2. That total is inaccurate because Exhibit J has calculation errors in three quarters, the 4th quarter of 1999, 1st quarter of 2000, and the 4th quarter of 2000. Therefore, the correct number of six-minute periods of excess opacity from December 23, 1999, 5 years before the lawsuit was filed, through December 31, 2004 is 13,003, not 15,480.

5. I have reviewed the tables labeled as Kiln #2 Particulate Matter Violations identified as Exhibit P to Plaintiffs' Motion for Partial Summary Judgment to Establish Defendant's Liability for Opacity Violations. Exhibit P reports there were 800.6 hourly periods where Mountain Cement excess opacity was greater than 20%. That total is inaccurate because Exhibit P includes all excess opacity in the 4th quarter of 1999, not just those from December 23-31 of 1999, 5 years before the lawsuit was filed, and all excess opacity in the 1st quarter of 2005 after Plaintiffs filed their suit. Therefore, the correct number of hourly periods of excess opacity greater than 20% from December 23, 1999 through December 31, 2004 is 579.2 hours, not 800.6 (see attachment #4). Of the 579.2 hourly periods where opacity was greater than 20% only 4.9 hours were identified on the quarterly reports as unknown causes. The other 574.3 hours (99.2% of the total hourly periods) are identified as being caused by events defined as startup, shutdown, malfunction or other excused causes.

6. Based on the information reviewed, my experience and expertise with this ESP, and ESPs at other similar plants, in my opinion MCC has been operating the ESP and Kiln System correctly and performing the proper maintenance to the ESP and Kiln System. The identified causes of the excess opacity that occurred are normal to Kiln operation and startups, shutdowns, and/or malfunctions of the Kiln #2 system equipment.

7. The Kiln #2 ESP is sized sufficiently to maintain the stack opacity within compliance as defined by both the Wyoming and Federal regulations. The opacity trending and quarterly reports show that the ESP has been able to maintain opacity far below the 6 minute 20% opacity limit under normal operating conditions. The majority of the time during start-ups, shutdowns and malfunctions the opacity is below the 6 minute 20% opacity limit. Only under extreme conditions during startups, shutdowns and/or malfunctions has the opacity exceeded the 6 minute 20% opacity limits. It is important to recognize that start-ups, shutdowns and malfunctions of the kiln, rollermill and other equipment can typically last from 15 minutes to over 24 hours, and in that total time period of the start-up, shutdown and malfunction condition the opacity may never exceed or may partially exceed the 6 minute 20% opacity limit. In an effort to reduce the overall opacity levels under normal operating conditions, and further during start-up, shutdown and malfunction periods, the plant has been upgrading the ESP. This is in addition to the use of the more detailed categorized quarterly reports used to help them identify problems with the process and equipment more quickly. These upgrades and better reporting have resulted in a steady decrease of opacity exceedances and in 2004 the total time the opacity was in excess of the 6 minute 20% limit was for 1.75% of the total operating hours.

8. Based on my experience, using an ESP would be the better choice considering the conditions at the plant and the complexity of the Kiln #2 system. Because of the location of the plant (elevation above sea level) more than normal air flow for this type of Kiln #2 system is needed to provide enough oxygen for combustion in the kiln. This requires more process gas than usual to be bypassed around the roller mill, which creates conditions during start-ups, shutdowns and malfunctions that make the ESP the best choice as the pollution control equipment. It is safe to say that replacing the existing ESP with any type of new pollution control equipment should improve performance over the existing ESP, however, there is no clear cut advantage to using a baghouse in this application and especially at this plant location. In fact there are ESPs installed on this type of cement kiln system (preheater kiln system) that have outperformed baghouses. Considering the large swings in moisture and temperature that are required to operate the plant at the high elevation, a baghouse could actually operate poorer than an ESP as a result of damage to the bags from excessive heat or blinding of the bags from excess moisture levels that occur during normal shutdowns, startups and malfunctions.

9. If regulations change in the future and the existing ESP needs to be replaced with a new ESP or a new baghouse, it has been my experience that the most cost effective way to replace the ESP is to build the new equipment adjacent to the existing equipment. There is sufficient land to construct a new ESP or a new baghouse at the Wyoming facility. This method of construction allows the equipment to be built at minimum cost and tied in to the process over a 2 to 3 day outage or during an annual outage.

B. Qualifications of the Expert

1. I have specific expertise in the operation and maintenance of electrostatic precipitators (ESPs). I am currently President of TRK Engineering Services Inc., a consulting service group specializing in ESPs and their application in numerous industrial settings. I am also manager of, and a lecturer with, Precipitator Seminars, which has been conducting seminars on the operation and maintenance of electrostatic precipitators for the past 15 years. I am an electrical engineer with over 25 years experience in the particulate removal field, including 5 years as a field service engineer for Environmental Elements Corporation, an original equipment supplier of ESPs. I have been a speaker at the 1994 & 1998 World Mining Exposition in Chile. I have been a panelist at several of the ESP/FF (Fabric Filter) Round Table Forums.

2. I am the editor and one of the authors of the new EPRI (Electric Power Research Institute) "ESP Maintenance Guide" completed in February 2003. This manual will set the standards for ESP maintenance for many years to come. In 2003 and 2004 I conducted a series of web-based ESP maintenance seminars for EPRI, the first of its kind.

3. I earned my Bachelors of Science Degree in Electrical Engineering from Lehigh University in 1979.

4. I have personal knowledge of the ESP that controls emissions from Kiln #2 at the Mountain Cement Company (MCC) plant in Laramie, Wyoming. The first time TRK Engineering worked at the plant was December 16 –22, 1999 where we helped the plant during an unscheduled shutdown. Beginning in March 2000 and continuing through 2005, my company, TRK Engineering, performed annual inspections and maintenance on the ESP for Kiln #2 during the outages. I have visited MCC's plant on five occasions during annual outages and for on-line inspections and tuning of the ESP controls while Kiln #2 is operating.

5. Pursuant to my retention in the present matter, Mountain Cement Corporation (MCC) agreed to compensate me at the rate of $290.00 per hour for my time spent working or testifying in this case, plus expenses.

6. I have neither testified nor been deposed as an expert witness in the past four years.

C. Documents, Data and Other Information Considered, Reviewed and/or Referenced

1. MCC's quarterly reports from the 4th Quarter of 1999 to the 4th Quarter of 2004.

2. Biodiversity Conservation Alliance and Sierra Club Complaint.

3. Answer of Mountain Cement Company to the Complaint.

4. Chapter 5 - National Emission Standards Wyoming Air Quality Standards and Regulations

5. Review of the plant process and ESP operations during a June 7 & 8, 2005 plant visit.

6. Electrical Maintenance History Records 12/94 – 2/02

7. Mechanical Maintenance History Records 12/94 – 2/02

8. Electric Shop Logs 9/16/02

9. Electric Shop Logs 2/11/04

10. Daily Instrument log 2001

11. Kiln #2 Opacity- Explanation for Exceedance 2002

12. Kiln #2 Opacity- Explanation for Exceedance 2003

13. The Micropol ESP Manual

14. TRK Engineering/Precipitator Seminar's "Operations and Maintenance Seminar Reference Material on Electrostatic Precipitation", Jacob Katz & Thomas Keeler, rev. 2004.

15. Appendix A of the "Operation and Maintenance Manual for Electrostatic Precipitators", EPA/625/1-85/017, September 1985

16. "Electrostatic Precipitator Maintenance Guide" EPRI (E21376), February 2003.

17. "The Art of Electrostatic Precipitation" Jacob Katz, PE, 1979.

18. TRK Engineering Outage Reports Reference Number MC010622

19. TRK Engineering Outage Reports Reference Number MC020413

20. TRK Engineering Outage Reports Reference Number MC030410

21. TRK Engineering Outage Reports Reference Number MC040401

22. Exhibit J to Plaintiffs' Motion for Partial Summary Judgment to Establish Defendant's Liability for Opacity Violations.

23. Exhibit P to Plaintiffs' Motion for Partial Summary Judgment to Establish Defendant's Liability for Opacity Violations.

D. Description of Assignment

I have been asked to serve as an expert for MCC in this case. I was asked to review the relevant documents to the case and form an opinion of whether the causes of the excess opacity documented by MCC for Kiln #2 are Startups, Shutdowns and Malfunctions (SSMs) as defined by Wyoming and Federal regulations. I have also been asked to comment on the operations and maintenance of the Kiln #2 Electrostatic Precipitator (ESP) located at the MCC Laramie WY, Plant.

E. Assumptions

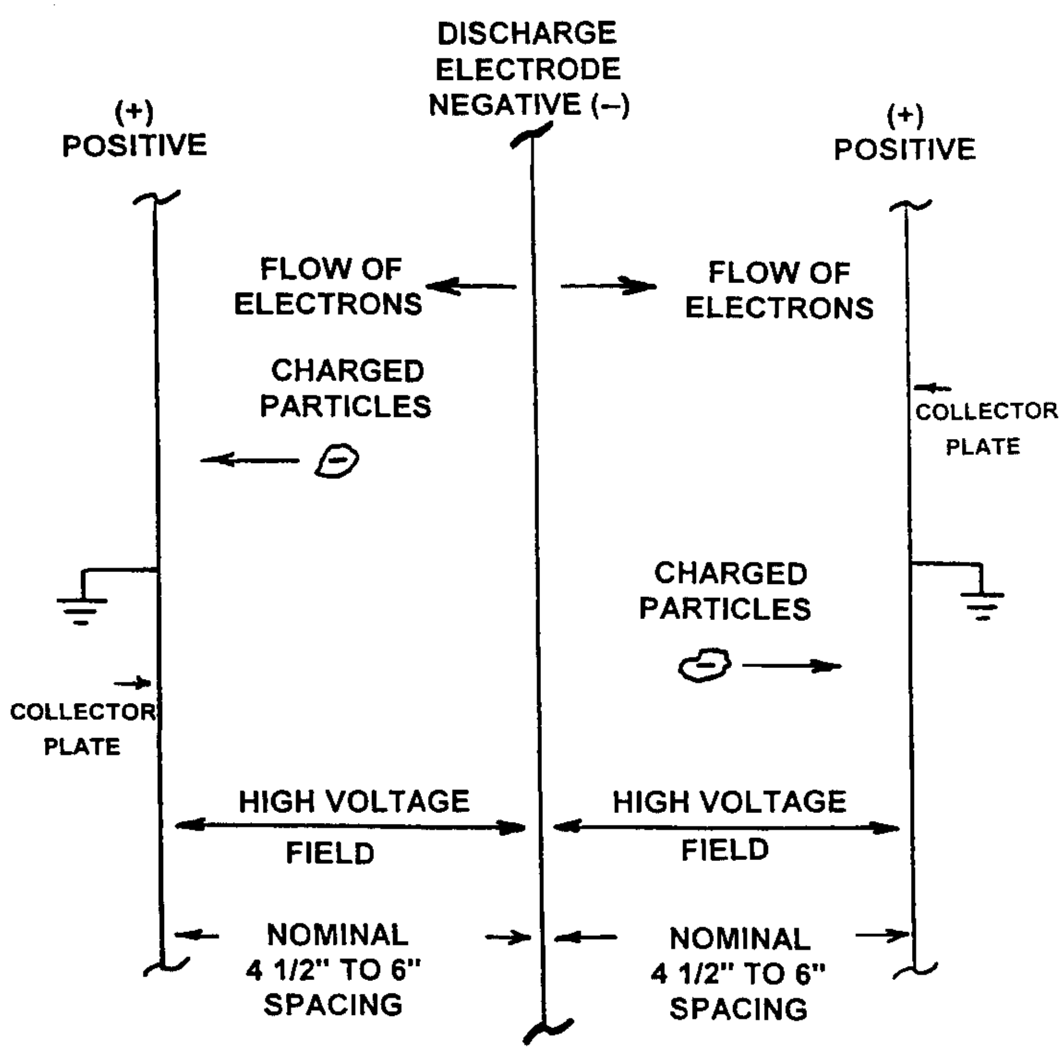
I have assumed that the data presented in the quarterly reports and the data reviewed are accurate.

F. Summary Report

Mountain Cement company has two kiln systems in operation at their Laramie WY Facility. Kiln #1 is a Long Dry Kiln that utilizes a Baghouse and Kiln #2 is a Preheater Kiln system that uses Preheater Cyclones integrated with a Raw Mill and Cooling Tower. The two Kiln systems are very different. Kiln #1 is a much simpler design that operates at a constant high temperature. The Kiln #1 system therefore should have less malfunction of the equipment and less start-up and shutdown period of the related equipment. Because of the simplicity of Kiln #1 it is my opinion that a Baghouse or an Electrostatic Precipitator that was designed properly would tend to have less excess opacity periods than similar equipment on the Kiln #2 system. Kiln #2 system is more complex because it has been designed to provide the feed material for both Kiln #1 and Kiln #2. This function alone makes Kiln #2 more complex and more likely to have startups, shutdowns and malfunction of the system's equipment. Because of theses difference and the complexity of the Kiln #2 system, the use of a baghouse on the Kiln #2 system would not have the same beneficial results as when the ESP was replaced with a baghouse on Kiln # 1 system.

The Kiln #2 System uses an electrostatic precipitator (ESP) to the collect the dust in the exhaust gas steam from the Preheater Kiln and the Roller Mill. For over 80 years electrostatic precipitators (ESPs) have been used in the cement application, and many other industrial applications, to collect particulate material from flue gas streams at very

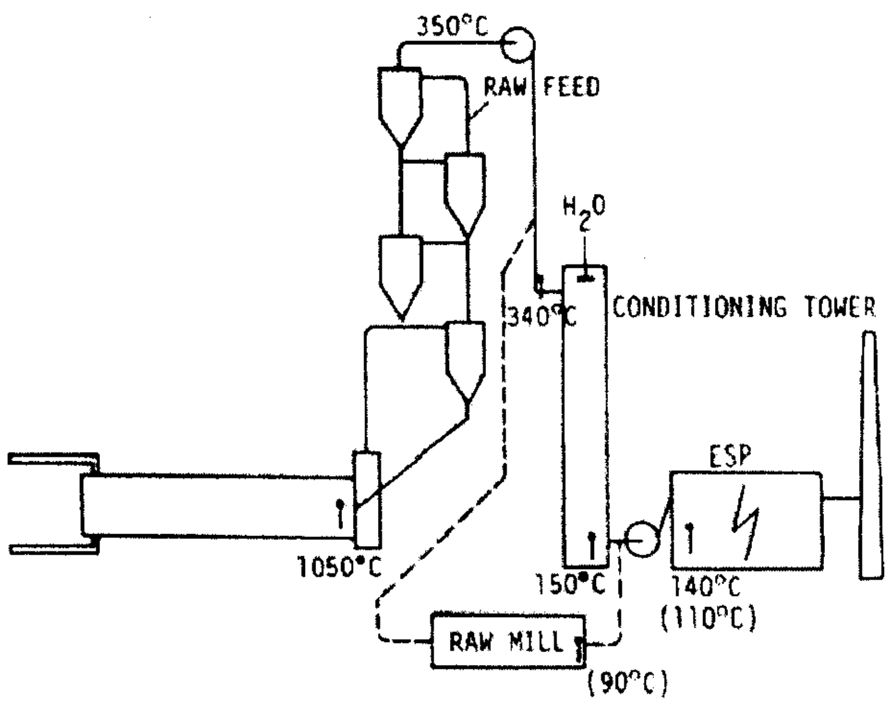
high efficiencies. The basic theory of electrostatic precipitation is based on the simple principle that opposites attract. The ESP is constructed of precisely aligned, light gauge collecting plates arranged parallel to the gas flow. Placed midway between the collecting plates are discharge electrodes that are energized with a high negative pulsating voltage. As particles suspended in the gas stream pass through the electrostatic field created by the discharge electrodes, they are charged and attracted to the collecting plates. The collected dust is then shaken loose by rappers, falling into hoppers located beneath the ESP for transport and reintroduction into the kiln system. Below is an example of the electrical field acting on the particles in the gas stream. The higher the voltage on the discharge electrode, the faster the particles will be pushed to the collecting plates and the higher the collection efficiency.



ELEVATION
CUT VIEW OF GAS PASSAGE

The electrostatic precipitator serving the Kiln #2 system is a dual chamber unit that was originally designed and manufactured by Micropol. A cyclone mechanical collector is located downstream of the roller mill prior to the precipitator. The precipitator has three mechanical fields (12'-9" X 30') and four electrical fields in the direction of gas flow. The electrostatic precipitator has 40 gas passages (20 per chamber) spaced at 9". The 1st field is divided into 2 electrical sections in the direction of gas flow, each energized by a dual bushing transformer rectifier rated at 45,000 Volts & 1000 Milliamperes. The 2nd and 3rd fields each have a single electrical field (formed by jumpering together the individual bus sections) energized by dual bushing transformers rated at 45,000 Volts & 2000 Milliamperes. The transformer rectifiers are controlled by SQ-300 automatic voltage controls supplied by Preciptech/BHA. Rapping of the collecting plates is via mechanical tumbling hammers; the discharge electrodes are rapped with electric rappers supplied by AVC Specialists. During the 2003 outage a new central computer was installed supplied by BHA. This computer was used to better control the rapper operations to help reduce opacity levels. The computer also provides data logging of the rappers, power levels of the transformer rectifiers and other process data to better trend the equipment parameters and pinpoint malfunctions faster to reduce opacity exceedances.

Below is a simple diagram of a Kiln system similar to the installation at the MCC Kiln #2.

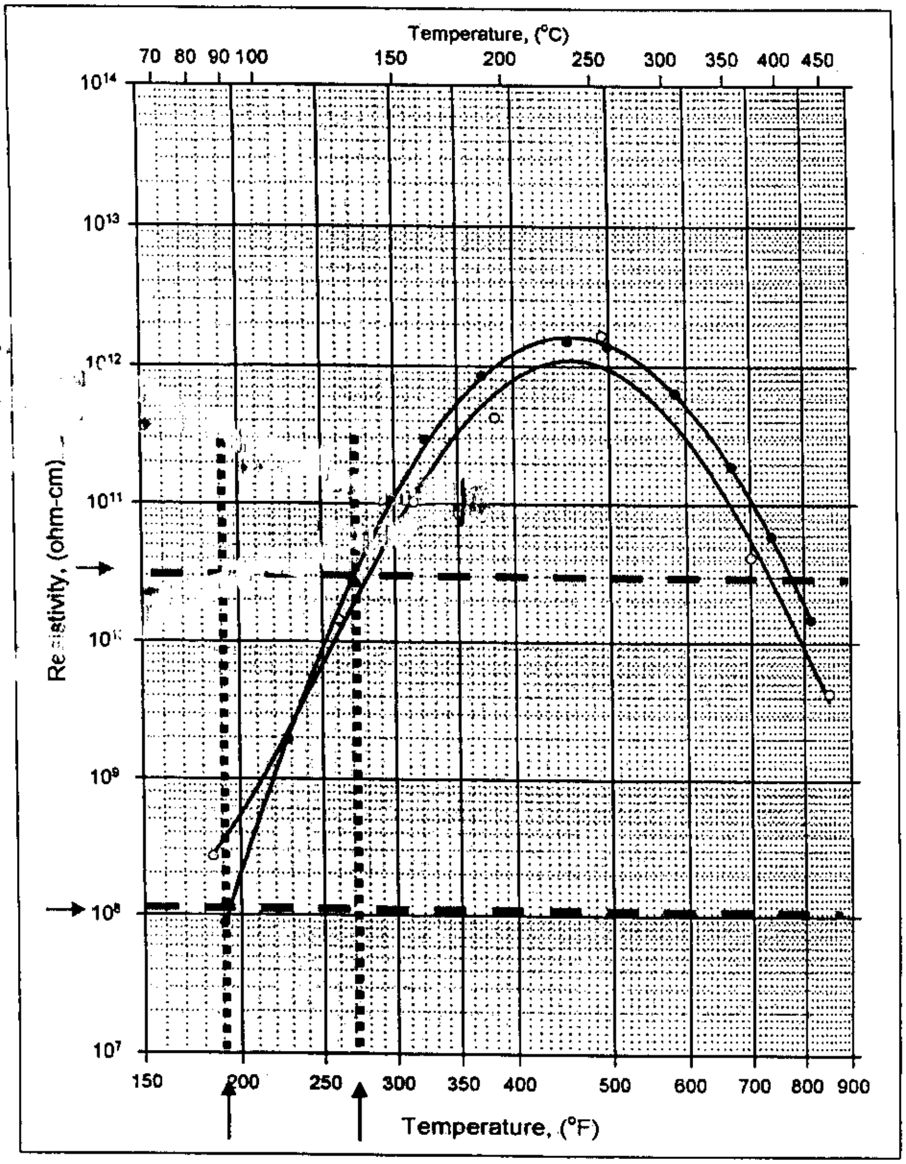


At Mountain Cement the major portion of the hot Kiln gasses pass through the raw mill, where the gas obtains moisture from the raw material in the mill, and is cooled by contact with the raw material. The cooled, moistened gas exiting the raw mill is then reunited and mixed with the remaining part of the kiln gas, which has been cooled in the conditioning tower. This gas mixture then enters the ESP, normally with ideal operating temperature and moisture content for good ESP operations. When the raw mill is stopped, all the kiln gases are diverted through the conditioning tower, where they are cooled with water sprays before entering the ESP. Again, the purpose is to condition the gas to temperatures and moisture contents that are conducive to good precipitation. This allows the ESP performance to be good with the mill in operation or with the mill stopped.

Unstable ESP operations and reduced efficiencies can occur when the raw mill and kiln are in process transition (startup or shutdown) which creates a fluctuation in the flue gas temperature and/or the flue gas moisture content. For instance, when the mill is shut down, the mill gate is swung to divert 100% of the flow to the cooling tower, which can allow the temperature in the ESP to increase rapidly without sufficient conditioning moisture. Similarly, when the Mill is started up, the flue gas is diverted to the cold idle mill, which must be heated up before the proper level of moisture can be achieved by evaporation of the material in the mill.

These changes in moisture content and temperature affect the ESP operation by affecting the resistivity of the particulate dust that is collected on the plates in the ESP. Resistivity is defined as the resistance of this dust layer to the flow of electric current , which develops a voltage drop across the layer. Think of this phenomenon as a form of Ohms Law (volts = current X resistance), and the voltage that occurs will be of different values across the whole area of the ESP depending on the localized conditions of the dust layer. It is this resistance of the layer, or resistivity, that can either help or hinder the collection efficiency of the ESP. For example, the cohesion of the dust particles in the layer will improve with rising resistivity levels. Conversely, excessive dust losses from the layer will occur as resistivity drops below a certain level. But the main impact of resistivity on the performance of the ESP will be seen in its effect on the electrical characteristics, both good and bad.

Below is a typical resistivity curve for a Preheater Kiln system. (This curve will vary depending on dust chemistry and moisture content).



Collection problems for cement dust from a preheater Kiln generally occur when dust resistivity is below 10^8 ohm-cm. At this level the resistivity is too low and the material can not be held on the collecting plates, resulting in increased opacity because of elevated reentrainment losses. Conversely, when the dust resistivity is above 2 X 10^{10} ohm-cm the ESP typically begins to spark and the voltage is reduced. At this high level, opacity will increase because of the reduced collection efficiency caused by the reduced operating voltages. For most plants, there is an optimum good temperature zone where dust resistivity is favorable for good ESP performance. In the example above this optimum operating zone would be 190 degrees F to 270 degrees F. This optimum zone can change with changes in the moisture content of the flue gas and changes in the chemical compositions of the dust.

Although adverse dust resistivity, influenced by gas temperature, moisture content, and dust chemistry, is the most common condition afflicting ESP performance, there are a multitude of other conditions that can affect ESP performance. ESP performance can be adversely affected by loss of TR voltage, reduced KV levels caused by an increase in sparking from excessive buildups on the internal components, damage to the internal components, or hopper pluggages. Localized air infiltration and/or sudden or fluctuating changes in gas flow rates can also increase opacity by increasing reentrainment losses. Startups, Shutdowns and/or Malfunctions (SSM) of process equipment in the Kiln system can cause any of the adverse conditions that will reduce ESP performance and result in higher stack opacity.

The majority of the excess exceedances documented over the review period were attributed to Startups, Shutdowns and/or Malfunctions (SSM) of process equipment. I reviewed the National Emissions Standards in the Wyoming Air Quality Standards and Regulations, and am familiar with the definitions of "startup", "shutdown", and "malfunction" in WASRQ Chapter 5, Sections 2 and 3. Malfunctions are defined by the State of Wyoming and the Federal Government as any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. All of the malfunctions listed on the MCC quarterly reports would be considered infrequent and none of the unknown malfunctions contributed to more than 0.08% of the total excess opacities (see attachment #1). Additionally, there was no repetitive contribution of any of the malfunction causes from quarter to quarter.

The MCC quarterly reports from December 23, 1999 through the 4th Quarter of 2004 demonstrate that 99.92 % of the excess opacity experienced by MCC during that period can be related to a startup, shutdown, malfunction or other excused causes. Prior to the 3rd Quarter of 2002 MCC identified the causes of excess opacity based on the standard form found in the Chapter 5 - National Emission Standards Wyoming Air Quality Standards and Regulations (Attachment #2). These regulations require documentation to identify the excess opacity only as a Startup/Shutdown, Control Equipment Problems, Process Problems, Other Known Problems, and Unknown Causes. Starting in the 3rd Quarter of 2002 MCC began to categorize causes of excess opacity in greater detail in an effort to better identify the causes of excess emission incidents to improve operations and reduce the number of occurrences of excess opacity. Causes of excess opacity after the 3rd Quarter of 2002 were identified as attributable to one or more of the following:

Item #	Cause of Excess Opacity	Description *
1	Kiln start up	Start putting feed into kiln. Includes cold startup and hot startup. (fuel feed but no kiln feed)
2	Kiln shut down	Stop rotation of kiln; stop kiln fuel feed
3	Raw mill start up	Start up of raw mill
4	Raw mill shut down	Shut down of raw mill

5	Opacity increased while starting up auxiliary equipment	Includes start up of ID fan, precipitator fans, elevators and conveyors, other equipment
6	Erratic feed rate	Bridging or plugging of kiln feed system
7	Erratic fuel rate	Bridging or plugging of fuel feed system
8	Plugged system	Preheat tower plug or kiln ring formation
9	Broken dust collector bag(s)	Broken baghouse bags
10	Electrical malfunction in precipitator	Trip of AVC controls or rapper controls in ESP
11	Mechanical malfunction in precipitator	Breakage of internal components (plates, hammer, wire) or hopper plugs
12	Lost auxiliary equipment	Shutdown or malfunction of ID fan, precipitator fan, elevator or conveyor, or other equipment
13	Lost spray tower exit temperature control	Problem with spray system: water sprays, pumps, solenoids, etc.
14	Working in/on process system	Shutdown for repairs caused by a malfunction
15	Working in/on pollution control equipment	Full or partial shutdown for repairs caused by a malfunction
16	Fan output began ramping up or down	Plug in system or oscillation caused by electrical problem or system pluggage (item #8).
17	Process/ID fan malfunctioned or shut down unexpectedly	Could be any process fan that has a malfunctioned
18	Malfunction of sprays at spray tower	Malfunction of spray nozzles/lances
19	Process gas temperature was out of optimum range	Caused by Item # 18 or # 13
20	Electrical surge / outage / power bump	External power source caused tripping of plant equipment
21	Unknown cause	Excess opacity event that self-corrects before the cause can be identified.
22	Dirty monitor lens	Monitor failure
23	Monitor failed or began sending erroneous data	Monitor failure
24	Other cause	Excess opacity event that self-corrects before the cause can be identified.
25	WDEQ/ADQ – approved precipitator inlet temperature test	Received WDEQ waiver of opacity limits for MACT test

*Note: The above descriptions are not on the quarterly reports. These descriptions were provided by plant personnel during the site visit on June 7 & 8, 2005. During that visit, I inspected the ESP and visited with MCC's plant manager, Mike Meysing, and environmental manager, Bill Sansing, to obtain a

better understanding of MCC's description of the causes listed in its quarterly excess opacity reports. I also reviewed the 2002 and 2003 Kiln #2 explanation of opacity exceedance forms that MCC's operators in the control room fill out when there is excess opacity from Kiln 2. These forms identify the cause and corrective action taken of each period of excess opacity and supported the explanations provide by Mike Meysing and Bill Sansing.

The above classified causes (other than unknown) used by MCC on their newer quarterly reports in my opinion are all considered a Startup, Shutdown and/ or Malfunction (SSM) of the kiln system equipment. The unknown causes (#21 & #24) listed above were minimal, averaging .08% of the operating time over the 5-year review period. The unknown causes typically rapidly occurred and self corrected. Their short duration did not provide enough time to identify the cause of the events that caused an increased opacity levels.

The above causes can be categorized into startup, shutdown or malfunctions (SSM) as follows:

<u>Startup/Shutdown</u>

- Kiln start up
- Raw mill start up
- Opacity increased while starting up auxiliary equipment
- Kiln shut down
- Raw mill shut down
- Lost auxiliary equipment
- Working in/on process system
- Working in/on Pollution Control Equipment

<u>Malfunction</u>

- Erratic feed rate
- Erratic fuel rate
- Plugged system
- Broken dust collector bag(s)
- Electrical malfunction in precipitator
- Mechanical malfunction in precipitator
- Lost spray tower exit temperature control
- Fan output began ramping up or down
- Process/ID Fan malfunctioned or shut down unexpectedly
- Malfunction of sprays at spray tower
- Process gas temperature was out of optimum range
- Electrical surge / outage / power bump

- Control Equipment Problems
- Dirty monitor lens
- Monitor failed or began sending erroneous data

Unknown or Excused Causes

- Unknown cause
- Other cause
- WDEQ/ADQ - Approved Precipitator Inlet Temperature Test

The use of the categorical breakdown of excess opacity causes starting in the 3rd Quarter of 2002 allowed the plant to take a proactive step towards reducing excess opacities. The excess opacity periods for Kiln #2 have decreased steadily from 2002 to 2004; in 2002 the annual total was 4.03% of the operating hours, in 2003 the annual total was 2.60% of the operating hours, and in 2004 the annual total was 1.75% of the operating hours. (See attachment #1)

The Wyoming & Federal Regulations state that failures that are caused in part by poor maintenance or careless operation are not malfunctions. (see attachment #2) In the review of the maintenance logs and the annual outage reports the plant has been performing all required routine preventative maintenance (PM) on the Kiln #2 system equipment and has been upgrading systems to improve reliability of the equipment. The maintenance logs show that MCC is performing daily, weekly, and monthly maintenance as required for the ESP. The plant has performed the required annual maintenance on the ESP and has made improvements to the ESP during each annual outage. These improvements have included flow modifications to improve the temperature distribution in the ESP, the installation of a new ESP data management system, and a new rapper panel. All of these improvements represent proactive measures to reduce stack opacity and what would be considered more than routine maintenance to the ESP.

The Kiln #2 ESP is sized sufficiently to maintain the stack opacity within compliance as defined by both the Wyoming and Federal regulations. The opacity trending and quarterly reports show that the ESP has been able to maintain opacity far below the 6 minute 20% opacity limit under normal operating conditions. The majority of the time during start-ups, shutdowns and malfunctions the opacity is below the 6 minute 20% opacity limit. Only under extreme conditions during startups, shutdowns and/or malfunctions has the opacity exceeded the 6 minute 20% opacity limits. It is important to recognize that start-ups, shutdowns and malfunctions of the kiln, rollermill and other equipment can typically last from 15 minutes to over 24 hours, and in that total time period of the start-up, shutdown and malfunction condition the opacity may never exceed or may partially exceed the 6 minute 20% opacity limit. In an effort to reduce the overall opacity levels under normal operating conditions, and further during start-up, shutdown and malfunction periods, the plant has been upgrading the ESP. This is in

addition to the use of the more detailed categorized quarterly reports used to help them identify problems with the process and equipment more quickly. These upgrades and better reporting have resulted in a steady decrease of opacity exceedances and in 2004 the total time the opacity was in excess of the 6 minute 20% limit was for 1.75% of the total operating hours.

Based on my experience, using an ESP would be the better choice considering the conditions at the plant and the complexity of the Kiln #2 system. Because of the location of the plant (elevation above sea level) more than normal air flow for this type of Kiln #2 system is needed to provide enough oxygen for combustion in the kiln. This requires more process gas than usual to be bypassed around the roller mill, which creates conditions during start-ups, shutdowns and malfunctions that make the ESP the best choice as the pollution control equipment. It is safe to say that replacing the existing ESP with any type of new pollution control equipment should improve performance over the existing ESP, however, there is no clear cut advantage to using a baghouse in this application and especially at this plant location. In fact there are ESPs installed on this type of cement kiln system (preheater kiln system) that have outperformed baghouses. Considering the large swings in moisture and temperature that are required to operate the plant at the high elevation, a baghouse could actually operate poorer than an ESP as a result of damage to the bags from excessive heat or blinding of the bags from excess moisture levels that occur during normal shutdowns, startups and malfunctions.

If regulations change in the future and the existing ESP needs to be replaced with a new ESP or a new baghouse, it has been my experience that the most cost effective way to replace the ESP is to build the new equipment adjacent to the existing equipment. There is sufficient land to construct a new ESP or a new baghouse at the Wyoming facility. This method of construction allows the equipment to be built at minimum cost and tied in to the process over a 2 to 3 day outage or during an annual outage.

Based on the information reviewed, my experience and expertise with this ESP, and ESPs at other similar plants, in my opinion MCC has been operating the ESP and Kiln System correctly and performing the proper maintenance to the ESP and Kiln System. The identified causes of the excess opacity that occurred are normal to Kiln operation and startups, shutdowns, and/or malfunctions of the Kiln #2 system equipment.

I prepared as Attachment #1 a table of excess opacity using data from the quarterly reports that MCC submitted to the Wyoming Department of Environmental Quality covering periods from December 23, 1999 through the fourth quarter of 2004 (the review period). Of the 1,300.3 hours of excess opacity during the review period, it is my opinion that 97.5 percent of the excess opacity periods, or 1,268.3 hours (or 12,683 six-minute periods) are identified as being caused by startup, shutdown, malfunction or other excused causes. The 2.5 percent of excess opacity periods for Kiln #2 that are identified as unknown causes represent only 32.0 hours (or 320-six-minute periods) of excess opacity from December 23, 1999 through fourth quarter 2004.

I have reviewed the chart of excess opacity at MCC that is identified as Exhibit J to Plaintiffs' Motion for Partial Summary Judgment to Establish Defendant's Liability for Opacity Violations. Exhibit J reports there were 15, 480 six-minute periods of excess opacity from Kiln 2. That total is inaccurate because Exhibit J has calculation errors in three quarters, the 4th quarter of 1999, 1st quarter of 2000, and the 4th quarter of 2000. Therefore, the correct number of six-minute periods of excess opacity from December 23, 1999, 5 years before the lawsuit was filed, through December 31, 2004 is 13,003, not 15,480.

I have reviewed the tables labeled as Kiln #2 Particulate Matter Violations identified as Exhibit P to Plaintiffs' Motion for Partial Summary Judgment to Establish Defendant's Liability for Opacity Violations. Exhibit P reports there were 800.6 hourly periods where Mountain Cement excess opacity was greater than 20%. That total is inaccurate because Exhibit P includes all excess opacity in the 4th quarter of 1999, not just those from December 23-31 of 1999, 5 years before the lawsuit was filed, and all excess opacity in the 1st quarter of 2005 after Plaintiffs filed their suit. Therefore, the correct number of hourly periods of excess opacity greater than 20% from December 23, 1999 through December 31, 2004 is 579.2 hours, not 800.6 (see attachment #4). Of the 579.2 hourly periods where opacity was greater than 20% only 4.9 hours were identified on the quarterly reports as unknown causes. The other 574.3 hours (99.2% of the total hourly periods) are identified as being caused by events defined as startup, shutdown, malfunction or other excused causes.

I reserve the right to supplement my opinions regarding this matter, as additional information becomes available.

Executed this 15th day of August, 2005, at Carlisle, Massachusetts

Thomas R. Keeler

UNITED STATES DISTRICT COURT
DISTRICT OF WYOMING

BIODIVERSITY CONSERVATION ALLIANCE and SIERRA CLUB RESPONSIBILITY, Plaintiffs, v. **MOUNTAIN CEMENT COMPANY** Defendant.	**CIVIL ACTION FILE** **NO. 04CV-361-B**

REPORT OF RALPH L. ROBERSON FOR MOUNTAIN CEMENT COMPANY

August 2005

Ralph L. Roberson

EXHIBIT

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TABLE OF CONTENTS

I. STATEMENT OF COMPLIANCE WITH THE FEDERAL RULES OF CIVIL PROCEDURE

The following is a list of the items provided in my report as required by the Federal Rules of Civil Procedure:

- This report contains my opinions and conclusions, as well as the basis and reasons for those opinions and conclusions.

- Part II contains a statement of my qualifications, and Appendix B contains my resume, including a listing of publications and presentations. During the preceding 4 years I have testified at the following trial:

  Grand Canyon Trust et al. v. Public Service Company of New Mexico, No. CV 02-552 BB/ACT (New Mexico)

  And I have given depositions in the following two cases:

  United States et al. v. Ohio Edison et al., No. C2-99-1181 (S.D. Ohio)
  Sierra Club, et al. v. NREPC, et al., File Nos. DAQ-26003-037 and DAQ-26048-037 (Kentucky Administrative Proceeding)

- RMB Consulting & Research, Inc. is being compensated at the rate of $200 per hour for the time I spend on this project. Payment is not contingent on my findings or the outcome of this matter.

Since discovery is ongoing in this case, I reserve the right to supplement my report. I also reserve the right to use any exhibits or documents considered, relied upon, identified or used by any other witness in this case.

II. QUALIFICATIONS

I received my Bachelors and Masters degrees in mechanical engineering from the University of Virginia. I am a registered professional engineer and president of RMB Consulting & Research, Inc. I have approximately 35 years of experience in analyzing air pollution emission standards, conducting air pollution measurements, and assessing the performance of air pollution control technology. My recent experiences include providing technical assistance to electric utility companies in complying with consent decree requirements that mandate the purchase, installation and operation of particulate matter (PM) and mercury (Hg) continuous emission monitors (CEMS). I independently conducted a case-by-case mercury MACT analysis, and the results of my analysis are reflected in a power plant construction permit. Since 1975, I have reviewed, analyzed and provided technical comments on every rule proposed by EPA that affects continuous emission monitors and continuous emission monitoring requirements for power plants and other industrial sources. In 1983, I was the principal author of *Continuous Emission Monitoring Guidelines*, a document published and still being used and updated by the Electric Power Research Institute (EPRI). For the past decade, I have worked extensively to develop the use of state-of-the-art statistical techniques for (1) estimating emissions and analyzing emission data; (2) determining achievability of emission standards; and (3) assessing impacts on ambient air quality.

III. PURPOSE

I, Ralph L. Roberson, with RMB Consulting & Research, Inc. (RMB) was retained on behalf of Mountain Cement Company ("MCC") to provide expert opinion on (1) the two primary methods of measuring opacity (i.e., EPA Reference Method 9 and continuous opacity monitoring systems (COMS)) and (2) a compliance assurance monitoring (CAM) Plan for Kiln No. 2. The MCC facility operates under its Title V Operating Permit and the laws and regulations of the State of Wyoming.

The MCC facility produces Portland cement using two coal-fired kilns and various other process components including raw mills, clinker coolers, and material handling equipment. In simple terms, the Portland cement process involves blending limestone with shale or clay and iron and grinding the material into a fine powder, which is called raw meal. The raw meal is fed into a rotary kiln, which uses coal to generate the temperatures necessary to form clinker. The clinker is cooled, mixed with gypsum and ground into a fine power, which is Portland cement.

In this report, I present a comparison of the two opacity measuring methods, the resulting impact on the stringency of the opacity standard applicable to MCC's plant located in Laramie, Wyoming when using periodic readings (i.e., Method 9) versus the use of continuous data (i.e., COMS), and other technical issues related to monitoring opacity from flue gas stacks. I also present an analysis of the opacity and particulate matter (PM) correlation in MCC's CAM Plan and the problems with using COMS data to predict particulate matter emission rates. When MCC renewed its Title V Operating Permit, the Wyoming Department of Environmental Quality (WDEQ) required a CAM Plan for emission points with pollution control technology, including Kiln No. 2. For the Kiln No. 2 CAM Plan, MCC submitted a "loose" mathematical relationship between stack opacity and hourly PM emission rates. I use the word, "loose" because (1) the CAM Plan did not utilize all available data and (2) no statistical analysis of the relationship was performed. A straightforward statistical analysis of the data would reveal the huge variability in the opacity/PM emission rate relationship.

IV. SUMMARY OF CONCLUSIONS

In my opinion, an emission standard consists of at least three essential, interrelated elements: (1) the numerical limit, (2) the averaging time, and (3) the compliance measurement method and/or frequency. Changing or modifying any one of the elements without making a compensating change in the others can significantly alter the stringency of any emission standard. In my opinion, because of its original development as a "periodic" standard, the Wyoming opacity standard, when enforced with COMS data, is considerably <u>more stringent</u> than the limit when enforced with periodic Method 9 observations. This principle will be discussed in detail in subsequent sections of my expert report. Moreover, in recognition of this principle, a number of states have or are in the process of amending their visible emissions rules to adjust the stringency to account for the use of COMS data. It is my understanding that Wyoming has a practice that is similarly effective. That is, the Wyoming DEQ follows EPA's High Priority Violations policy for all major sources. Consistent with that policy, WDEQ takes no enforcement action if opacity exceedances measured by COMS occur less than 5 percent of the operating time in any one quarter or less than 3 percent of operating time in two consecutive quarters.

Wyoming regulations allow the use of "credible evidence" or information to determine compliance but only if such evidence or information is relevant to whether the source would have been in compliance with applicable emission limits *if* the appropriate compliance test had been performed. MCC's permits specify that compliance with the PM limit for Kiln No. 2 be determined annually by conducting a stack test using EPA Reference Method 5. It is also my opinion that in the absence of substantial data that establishes a more robust relationship between COMS data and Method 5 data for MCC Kiln No. 2, it cannot be said with reasonable certainty that any given COMS data are credible evidence of failing a PM compliance test. Therefore, in my opinion, without such robust data, COMS data cannot be the sole basis for determining non-compliance with a PM emission standard that requires averaging the results from three independent, 1-hour sampling runs using EPA Method 5.

V. THE REPORT

1. Overview of Types of Emission Standards

Emission standards developed by regulatory agencies generally fall into two categories: (1) periodic standards – in which the evaluation of the source and the control equipment is based on limited periodic "snapshots" of emissions using short-term tests performed during representative operating conditions (e.g., EPA Reference Method 5 tests for PM emissions, EPA Reference Method 9 for visible emissions); and (2) continuous standards – in which the evaluation of the source and of the control technology is based on data obtained from continuous monitoring, that is, data collected during all operating conditions.

The primary characteristic of a "periodic" standard is that it is developed from the analysis of a limited data set collected during representative operating conditions. Periodic emission tests cannot quantify long-term variability in the operation of a source or in the operation of any control technology.[1] Emission standards developed from such periodic tests are therefore not designed to be monitored on a continuous basis. Thus, in my opinion, data obtained from continuous monitoring systems, such as COMS, should not be used as a measure of compliance with emission standards based on periodic tests such as Method 9 for opacity and Method 5 stack tests for PM emissions. In contrast, "continuous" standards that are developed based on long-term, continuous emissions data allow the variability of both the source and the control technology to be factored into the setting of an emission standard.

When short-term tests are used to collect the data for the development of "periodic" standards, the compliance method specified for such standards is generally the same periodic test performed under "representative" (but not all) operating conditions. Similarly, when continuous data are used to develop "continuous" standards, the continuous method (e.g., a continuous emission monitor) is generally specified for determining compliance with those standards. From time to time, regulatory agencies are faced with a situation in which a continuous method for monitoring emissions from a source becomes available long after a standard based on periodic test data has been established. In such situations, the application of the continuous method to determine compliance with a periodic standard would make the standard more stringent. To maintain the same stringency, agencies convert the "periodic" standard to a "continuous" standard before requiring the use of the continuous method for determining compliance. In making this

[1] Throughout this report, when I use the phrase, *variability*, with respect to the operation of a source, I am referring to the fact that, in my opinion, no process or piece of equipment operates as designed 100 percent of the time. In

conversion, agencies recognize that the stringency of an emission limit is determined not just by the numerical value of the standard but also by the averaging time associated with the numerical limit and the method used to make emission measurements. Agencies generally convert a "periodic" standard to a "continuous" standard by adjusting the averaging time or by providing for de minimis relief periods during which excursions above the numerical limit are excused. The examples provided below illustrate this point in the context of EPA's rulemaking process for New Source Performance Standards (NSPS) under the Clean Air Act and State agency revisions to opacity standards as a result of the availability of COMS data.

2. Interrelationship of the Elements that Make-up Emission Standards

As previously stated, an emission standard consists of at least three essential, interrelated elements: (1) the numerical limit, (2) the averaging time, and (3) the compliance measurement method and/or frequency. The following examples taken from EPA rulemaking actions illustrate the Agency's recognition that altering any one of the interrelated elements of an emissions standard without making a compensating adjustment can affect the stringency of the underlying standard. Section V.5 of this Report will provide similar examples of regulatory actions, taken at the state level, that reflect acknowledgment of the impact of measurement frequency on the stringency of an emission standard.

2.1 Averaging Time

The interrelationship of numerical emission limits and averaging time is illustrated by EPA's rulemaking efforts in developing standards for new utility boilers in 40 CFR 60, Subpart D. EPA proposed and promulgated Subpart D in 1971.[2] At that time, EPA's data for developing emission standards were limited to periodic, snapshot measurements. EPA analyzed these data and set standards for PM, opacity, sulfur dioxide (SO_2) and nitrogen oxides (NO_x). To be consistent with the supporting data (and recognizing that continuous measurement technology was still under development), EPA specified compliance demonstrations be based on the periodic application of manual test methods to be conducted under representative operating conditions. In contrast, when EPA undertook revising the NSPS in the late 70's, the Agency decided it wanted to use continuous data for its SO_2 and NO_x emission standards. Accordingly, EPA used continuous emission monitors (CEMS) to collect the background data, conducted a rigorous statistical analysis of the data, and concluded that rolling 30-day averages were appropriate for

fact, processes and equipment are subject to breakdowns, malfunctions, and other natural perturbations.

[2] Subpart D applies to fossil fuel-fired steam generators (i.e., boilers) for which construction commenced after

the numerical emissions limits that the agency had selected.

In October 1983, EPA proposed to change the compliance method for the Subpart D SO_2 NSPS from a periodic method to a continuous method.[3] At the heart of EPA's proposal was a switch from periodic measurements (i.e., EPA Method 6) to continuous emission measurements (i.e., CEMS). When considering this change to the measurement procedure, EPA recognized that it also needed to address the issue of averaging time. After reviewing the underlying database, especially the data pertaining to the sulfur content of coal, EPA concluded that a 30-day rolling average would be the appropriate averaging time to maintain consistency with the Subpart D SO_2 NSPS as it was promulgated in 1971. In its October 1983 proposal, EPA produced two tables that clearly illustrate the relationship between numerical limits and averaging times. Table 1 in EPA's proposal presented the range of average sulfur concentration in coal required to meet the 1.2 $lb/10^6$ Btu emission limit as a function of averaging time. Table 2 listed the U.S. low-sulfur coal reserves that would be expected to comply with various mean sulfur concentrations listed in Table 1. When Tables 1 and 2 are read together, it is apparent that a short-term (e.g., 3-hour) interpretation of the NSPS would severely limit the supply of compliance coal. However, on a longer-term basis (i.e., 30-day rolling average), about 25 percent of the known U.S. coal reserves could comply with the 1.2 $lb/10^6$ emission limit. Since this outcome was the Agency's original intent of the NSPS, EPA concluded that a 30-day rolling average would be the appropriate averaging time to couple with continuous SO_2 monitoring data. Although EPA never finalized this rulemaking, the Agency's technical analysis clearly quantifies the relationship between numerical limits and averaging times. Since the revisions to Subpart D were not finalized, the SO_2 standard in this rule remains a periodic standard.

Another example of the relationship of averaging time and stringency of an emission standard can be found in the SO_2 portion of the NSPS proposed by EPA for fluid catalytic cracking unit (FCCU) regenerators at petroleum refineries. In its proposal, EPA specified a 3-hour averaging time for the SO_2 emission standard for new, modified, and reconstructed FCCUs.[4] Commenters stated that the averaging time should be increased because 3 hours did not provide adequate time to adjust parameters, to account for the natural variability of the operating process as well as the air pollution control technology, and thus assure compliance with the proposed emission standard at all times. In promulgating the final rule, EPA stated that it had statistically analyzed the long-term variability of SO_2 emissions from FCCUs by conducting a time series analysis of continuous emission data from a recent EPA study. EPA concluded that the averaging time did,

August 17, 1971.
[3] 48 Fed. Reg. 48960 (October 21, 1983).

indeed, need to be lengthened in order for the numerical limit to be consistently achieved with the use of continuous emission monitors. Accordingly, EPA revised the proposed averaging time for the SO_2 emission standard from 3-hours to 7-days.[5]

2.2 Compliance Measurement Methods

The relationship of the stringency of an emission standard and measurement procedure (e.g., measurement frequency) is illustrated in EPA's NSPS rule for kraft pulp mills (i.e., paper mills). The preamble to that rule also provides an excellent discussion regarding how EPA can use both periodic tests and continuous monitoring data to achieve the objective of the NSPS program. The first objective of an NSPS is to ensure that an affected source installs and operates the best demonstrated control technology.[6] EPA selects a numerical emission limit to reflect the performance of the best system of emission reduction when properly operated and maintained. The required performance test verifies the ability of the source to meet that emission limit. The second objective of an NSPS is to ensure that the source complies with the general duty to properly operate and maintain its equipment.[7] I believe EPA recognized that performance tests are time consuming and expensive to perform, and that continuous monitors could play an important surveillance role in verifying a source's general duty to operate equipment consistent with good air pollution practices, but this surveillance role did not contemplate using the continuous monitoring data to verify whether the emission limit of a "periodic" emission standard was being met. EPA determined that continuous monitors could be useful in identifying periods of excess emissions. Reports of excess emissions, in turn, could provide the Agency with information to determine if a source is meeting its general duty requirements to operate and maintain equipment to minimize emissions. EPA also realized that the continuous monitors (because of their capability of continuous measurements) identify all periods of excess emissions, including those that are not the result of improper operation of control equipment. EPA acknowledged that excess emissions encountered during start-up, shutdown, and malfunctions are generally unavoidable and should not be attributed to improper operation and maintenance. I also believe EPA recognized that process and pollution control equipment does not always perform as designed and thus excess emissions, which occur as a result of inherent variability or fluctuation within a process, should not be attributed to improper operation and maintenance of the control technology.

[4] 49 Fed. Reg. 2058 (January 17, 1984).
[5] 54 Fed. Reg. 34008 (August 17, 1989).
[6] Section 111 of the Clean Air Act states, "a standard of performance shall reflect the degree of emission limitation and the percentage reduction achievable through application of the best technological system of continuous emission reduction ... the Administrator determines has been adequately demonstrated."

Accordingly, in the kraft pulp mill NSPS, EPA established both a periodic Method 9 opacity and a parallel continuous monitoring opacity standard. The periodic opacity limit is 35 percent when measured by Method 9; but when continuous monitoring is used, periods in excess of 35 percent opacity are not violations unless more than 6 percent of the readings (excluding startup, shutdown, and malfunction) in a calendar quarter exceed 35 percent. In other words, there is a 6 percent de minimis level when compliance with the opacity limit is based on continuous monitoring data.[8] EPA tempered the stringency that would have resulted from the use of any or all of the continuous opacity data from the monitors by providing a de minimis exceedance level in recognition of the frequency of measurement.

2.3 Numerical Limits

Finally, an example of the adjustment of the stringency of an emission standard by modification of the numerical limit is EPA's revision to the NSPS for the primary aluminum industry. EPA originally promulgated a fluoride emission limit of 1.9 lb/ton of aluminum produced for prebake plants and 2.0 lb/ton for Soderberg plants. Shortly after promulgation, several aluminum companies filed petitions for administrative review of the NSPS arguing that the emission limits could not be achieved at all times - even by the best-controlled facilities. In response to the petition for review, EPA embarked on a program to collect additional data from the newest aluminum smelter in the U.S. After analyzing the new data, EPA concluded that the petitioners' argument was valid. To rectify the compliance problem, EPA reiterated the original emission limits but added regulatory language stating that emissions between 1.9 and 2.5 lb/ton for prebake plants and 2.0 and 2.6 lb/ton for Soderberg plants would be considered to be in compliance.[9] These excursions above the originally promulgated standard were allowed by EPA to account for the inherent variability of the fluoride emissions from the aluminum production process. The amended rule allowed for those excursions expressly in conjunction with a new requirement to conduct performance tests more frequently – monthly instead of annually, as originally required. In sum, EPA adjusted the stringency of the standard using a combination of increased testing frequency with a relaxed numerical limit to make the emission standard consistent with the underlying data.

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[7] The "General Duty" provision of the NSPS is codified in Title 40, Code of Federal Regulations, §60.11(d).
[8] See 40 CFR Sections 60.282(a)(1)(ii) and 60.284(e)(1)(ii).

3. Methods of Measuring Opacity

It is important to recognize that opacity is neither a pollutant nor an emission. Rather, opacity is the degree to which PM emissions reduce the transmission of light and obscure the view of an object in background.[10] It is my opinion that the consensus among environmental professionals is that opacity is best used as an indicator of proper operation and maintenance of PM control equipment. Using opacity as a surrogate for predicting PM emissions is less straightforward. It has been my experience that there is no strong correlation between opacity readings and PM emissions, and the relationship between opacity readings and the mass of PM emitted can vary dramatically among different sources. The relationship between opacity and PM emissions must be established for each source, and that relationship can change because the relationship is dependent on a number of variables including particle size, shape, and color.

3.1 EPA Method 9

Historically, the method used by a regulatory agency to verify that a source was operating and maintaining its PM control technology in accordance with good engineering practices was that of visual observations of the stack plume, often conducted beyond the fence line of the facility. Such observations could be done only infrequently (and still can be done only infrequently). Conducting opacity observations is a labor-intensive proposition. One observer, who must be qualified and certified in accordance with the requirements of EPA Method 9, is required per stack or per observation. EPA Method 9 requires the observer to record readings at 15-second intervals to the nearest 5 percent opacity. To be valid, a minimum of 24 observations must be recorded. Equally important, EPA Method 9 contains a number of requirements for conducting opacity readings that inherently limit the frequency at which such readings can be performed. For example, §2.1 of EPA Method 9 states, . . . "the qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back."[11] Thus, from a "requirements perspective," Method 9 observations can only be conducted a small fraction of the time that a plant can operate and, specifically, can not be conducted during a significant portion of a source's potential operating hours (e.g., at night, when precipitation is falling, etc.).

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[9] 45 Fed. Reg. 44202 (June 30, 1980).
[10] See, for example, Title 40, Code of Federal Regulations, section 60.2.
[11] Title 40, Code of Federal Regulations, Part 60, Appendix A, Method 9, §2.1.

There are also practical and cost considerations that limit the frequency at which regulatory agencies can reasonably be expected to conduct Method 9 observations. Perhaps the most obvious is the amount of manpower required -- to drive to a source, to obtain permission/clearance to enter the facility (when necessary), to properly position the observer with respect to the sun and the stack (per Method 9 requirements), and to take opacity readings for perhaps up to 1 hour. As a result of the manpower requirements and given all of the other duties of agency field personnel, Method 9 opacity readings have typically been conducted no more than once or twice per year at major sources. If there is a single, most prevalent schedule, it is for the regulatory agency to dispatch a certified observer to conduct Method 9 opacity readings concurrently with the source's annual PM emission tests. Thus, by combining the annual PM stack tests with Method 9 observations, the regulatory agency is able to establish at least one data point that relates PM emissions to a corresponding set of opacity readings in at least a general way.

3.2 COMS

COMS, on the other hand, is an instrument system designed to measure the attenuation of projected light due to the absorption and scattering of the light by PM in a gas stream. The basic components of a COMS are a light source, a retroflector (essentially a mirror), and a light detector. In a typical application, light travels from the light source across the gas stream to the retroflector, and then is reflected back through the gas stream to the light detector. As light travels through the gas stream some will be absorbed or scattered by the PM and not reach the detector. The transmittance through the gas stream is reduced, allowing only a percentage of the original light intensity to be measured by the detector. Opacity is related to transmittance by the following expression.

$$\textit{Opacity}\ (\%) = 100 - \textit{Transmittance}\ (\%)$$

In order to produce acceptable data, a COMS must meet the performance requirements set forth by EPA in Performance Specification 1 (PS-1).[12] Although COMS technology is relatively simple, in my opinion COMS measurements can nevertheless be subject to inaccuracies and biases, and it is noteworthy that all of the typical operating problems with COMS (e.g., misalignment of the transceiver and the retroreflector; dirt on optical surfaces; etc.) result in the readings being higher than the true opacity. Stated another way, typical breakdowns in the operation of COMS tend to produce readings that are biased high.

[12] Title 40, Code of Federal Regulations, Part 60, Appendix B, Performance Specification 1.

In 1996, Tom Rose prepared a report examining the potential errors in COMS measurements.[13] Basing his analysis on the measurement deviations permitted by PS-1, Mr. Rose concluded that the potential COMS measurement error is +7.5 percent opacity. Mr. Rose went on to conclude:

> COMS are useful as an indicator of baghouse performance but should not be used as the deciding factor to measure violations unless the 7.5% margin of error is used. As with any measurement system, knowledge of the errors associated with the measurement is necessary in the compliance/non-compliance decision process.

To date, EPA has not promulgated any significant quality assurance (QA) requirements to detect and correct such problems after certification – perhaps because COMS is neither a reference method nor the specified compliance method for EPA-developed opacity standards. In my opinion, without such QA requirements it is difficult to assess the accuracy of ongoing COMS measurements.

4. Statistical Considerations Related to the Stringency of Emission Standards

Over the past 30 plus years, I have examined numerous emission datasets. These datasets have included SO_2 emissions, NO_X emissions, and opacity data. Almost without exception, these data tend to fit a lognormal distribution. A lognormal distribution is a skewed distribution, one that is characterized by having an elongated tail instead of the classical bell-shaped curve characteristic of a normal distribution. It is relatively easy to visualize why emission distributions are lognormal. Emissions are naturally limited at zero (i.e., emissions cannot be negative), but for practical purposes, there is almost no upper bound limit to how high any specific air pollutant emission can be. Of course, opacity emissions are mathematically constrained at 100 percent and also at 0 percent. However, because of the installation and operation of highly efficient PM control technology, opacity readings also tend to be lognormally distributed with the tail or skewness being toward that of the higher opacity readings -- such as the example curve shown in Figure 1 of Appendix A.

The form of the distribution of opacity readings is very important, especially in the case where measurements or readings are conducted periodically, rather than continuously. As explained

[13] "Analysis of Errors in Continuous Opacity Measurement Systems," Tom Rose, prepared for Steel Manufacturers Association, December 2, 1996.

below, when measurements are conducted only periodically, the results obtained will be those that occur most frequently.

4.1 Statistically-Based Solution

One way of approaching the stringency issue is to pose the question - how often would Method 9 readings have to be taken in order to record at least one opacity excursion in excess of 20 percent? The probability ("P") of making a number of observations ("n") and not observing an event that occurs randomly twice out of every 100 possibilities (i.e., frequency of occurrence = 2%) is given by the equation $P = 0.98^n$. Likewise, the probability of making n observations and observing an event that occurs only two times out of every 100 possibilities is given by $P = (1-0.98^n)$. We have solved this equation for a series of observations (n) and plotted the results as Figure 2 of Appendix A. Figure 2 and the solution to the equation illustrates that if you wish to be 95 percent confident in observing an event that occurs 2 percent of the time, then you must make at least 148 random observations. Likewise, if you wish to be very confident (i.e., 99 percent) in observing an event that occurs 2 percent of the time, then you must make 228 random observations.

This statistical analysis relates to Method 9 observations as follows. Suppose a source has 6-minute average opacity readings in excess of 40 percent 2 percent of the time. Further, suppose that we wish to have a 95 percent confidence of detecting at least one such exceedance. Then, our statistical analysis shows that an observer would have to conduct 148 random Method 9 observations in order to be 95 percent certain of recording at least one exceedance.

This statistical analysis is independent of time. That is, if the Wyoming DEQ wished to record, at a 95 percent confidence level, one exceedance during a calendar quarter then the agency would have to perform 148 randomly spaced Method 9 observations during the quarter. If the agency wished to record, at a 95 percent confidence level, one exceedance during a calendar year then the agency would have to perform 148 randomly spaced Method 9 observations during the year. Thus, obtaining 148 random opacity readings would effectively require the performance of 148 Method 9 observations of a single stack. Clearly, performing 148 Method 9 tests every quarter (more than one test per day per stack) or 228 per quarter if a confidence level of 99 percent were desired, is beyond what any regulatory agency could reasonably be expected to perform.

4.2 Additional Statistical Approach

As previously discussed, periodic emission standards are those that were developed using periodic and limited emission testing data. Accordingly, the supporting database tends to be insufficient to characterize the variability in either the process or the air pollution control technology. For that reason, such standards are typically set at levels that may well be exceeded during any given test. Typically, such standards are set at a 5 to 10 percent probability of failure level along with the implicit assumption that compliance tests can only be conducted infrequently.

In 1995, Robert Ajax authored a paper that discussed the relationship of measurement frequency and the stringency of technology-based emission limits.[14] Table 2 from the Ajax paper is reproduced below.

Number of Exceedances Expected

	Frequency of Compliance Computation			
Probability Level of Standard	Every 6 Min.	Every 6 Hrs.	Daily	Annually
90%	8,760/yr	219/yr	36/yr	1/10 yr
95%	4,380/yr	110/yr	18/yr	1/20 yr

Mr. Ajax's tabulation compliments the statistical approach presented in Section V.4.1. That is, Mr. Ajax's table enumerates the number of exceedances expected as a function of measurement frequency and probability of compliance. For example, if a source were in compliance 95 percent of the time and compliance were measured every 6 minutes, then 4,380 exceedances would be expected per year. On the other hand, if compliance were measured daily, only 18 exceedances would be expected per year.

4.3 Combining the Statistical Approaches

Section V.4.1 of this report examined the proposition - how frequent must one make measurements in order to determine a specified (e.g., 2 percent) exceedance rate, at various levels of confidence. Given a measurement frequency, Section V.4.2 enumerates the number of expected exceedances as a function probability of compliance. These two analyses approach the question in more or less opposite directions, yet reach a consistent conclusion – that the stringency of an emission standard is strongly dependent on the frequency of measurement. In other words, increasing the measurement frequency will increase the stringency of a standard

[14] "The Effect of Compliance Test Frequency on the Stringency of Technology Based Standards," Robert L. Ajax, March 9, 1995.

unless one of the other elements (e.g., averaging time) is adjusted. Thus, it is my opinion that switching from Method 9 to COMS to enforce Wyoming 's opacity standard without a revision to one of the other elements of an emission standard (e.g., averaging time or numerical limit) results in a significantly more stringent opacity standard.

5. Recent Recognition by States that COMS is More Stringent than Method 9

Recently, a number of states have begun to revise their opacity regulations to account for measurement with continuous monitors while maintaining a periodic Method 9 compliance test. Such regulatory revisions are quite consistent with the action taken by EPA in the previously discussed kraft pulp mill NSPS.

5.1 Alabama

For a number of years, coal-fired utility boilers in Alabama have been subject to a visible emission standard, which is codified as Alabama Department of Environmental Management (ADEM) Rule 335-3-4.01(1). The visible emission standard was not developed using continuous monitoring data since such data were not available at the time the standard was developed more than 30 years ago. Under the Alabama rule, compliance with the visible emission standard is determined periodically by a certified observer making opacity readings in accordance with EPA Method 9. Alabama Rule 335-3-4.01(a) limits opacity to 20 percent, as determined by 6-minute averages. The 20 percent opacity limit in the current Alabama regulations and included in the Alabama SIP was developed as a periodic standard to be verified with Method 9. However, under ADEM Rule 335-3-4-.01(1)(b), visible emissions up to 40 percent are permitted during one 6-minute period in any 1-hour period, and emissions during startup, shutdown, and load change events are excluded.

Recently, the Alabama Department of Environmental Management (ADEM) proposed to amend its visible emissions regulation. Specifically, ADEM proposed to amend Rule 335-3-4-.01 by adding 335-3-4.01(3), 335-3-4.01(4) and 335-3-4.01(5). New paragraph (3) sets forth the requirements that a COMS must meet in order to be used to determine compliance with the visible emissions rule, which is provided in paragraph (1) of this rule. New paragraph (4) is the linchpin of ADEM's proposed rule amendment. Paragraph (4) states, "the permittee will not be deemed in violation of Rule 335-3-4-.01(1) if the non-exempt excess emissions periods do not exceed 2.0 percent of the source operating hours for which the opacity standard is applicable and for which the COMS is indicating valid data." This is clear evidence that ADEM understands

the difference between periodic and continuous standards, and recognizes that its 20 percent periodic (Method 9) opacity limitation cannot be achieved by a source operating its equipment consistent with good air pollution control practices during all operating periods, even when non-exempt periods are excluded. In other words, when changing from a periodic compliance method (e.g., Method 9) to a continuous compliance method (e.g., COMS data), an accompanying change is required (i.e., creating the 2 percent exemption) to maintain the stringency of the original visible emissions standard.

5.2 North Carolina Rule

The North Carolina Department of Environment and Natural Resources recently revised the North Carolina SIP with respect to the use of COMS data for opacity. North Carolina amended its visible emissions standard to establish a "reasonable procedure" for sources using COMS to demonstrate compliance with the visible emission standard. After first deducting potentially numerous exemptions (i.e., startup, shutdown, malfunction and other scenarios under the rule), the North Carolina rule allows opacity readings in excess of the numerical limit 0.8 percent of the time.[15] Initially, EPA approved this standard, after evaluation by North Carolina and others on the grounds, in part, that the rule "is designed to provide sources using COMS the same opportunity to comply with the visible emissions rule as sources that do not use COMS devices."[16] In other words, EPA concurred that the use of COMS to determine compliance with a standard developed with the intent to be enforced with Method 9 would result in a more stringent standard unless the numerical limit was revised upward or a de minimis excess emission period was excluded. EPA's initial approval was a direct final rule (one EPA deemed non-controversial) that also provided for subsequent withdrawal of approval to consider any adverse comments. EPA received such a comment, and, accordingly withdrew its approval of the North Carolina rule. However, it is important to note that EPA did not withdraw its statement about the effect of the North Carolina rule as equalizing the periodic and COMS standards.[17] Subsequently, EPA has proposed to approve, in its entirety, the Visible Emissions portion of the North Carolina State Implementation Plan (SIP).[18]

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[15] The numerical opacity limit in the North Carolina rule for sources in operation prior to July 1, 1971 is 40 percent.
[16] 68 Fed. Reg. 33874 (June 6, 2003).
[17] 68 Fed. Reg. 46101 (August 5, 2003).
[18] 70 Fed. Reg. 28496 (May 18, 2005).

5.3 Ohio

Similarly, following the current trend of promulgating continuous standards, which are modified to be equivalent to historical periodic standards, the Ohio Environmental Protection Agency in 2002 revised its regulations with respect to the use of COMS data. Ohio revised Rule 3745-17-03(B), to state that during each calendar quarter, the permittee shall be deemed in compliance with the opacity standard if the following conditions are met:

1. *The nonexempt opacity values in excess of twenty per cent opacity are less than 1.10 per cent of the six-minute average opacity values.*
2. *None of the nonexempt six-minute average opacity values exceeds sixty per cent.*
3. *The total amount of time, in hours, of exempt*[19] *and nonexempt opacity values greater than twenty per cent and less than sixty per cent (not including start-up, shutdown, and malfunction exemptions) does not exceed the product of 0.10 times the actual number of hours the emissions unit was in operation during the calendar quarter.*

Strangely (considering EPA's recent proposal to approve a de minimis period in North Carolina discussed above) EPA is proposing to disapprove the Ohio revisions that provide for the use of continuous opacity monitoring (COM) data to determine compliance with opacity limits, but allow specified de minimis periods. Apparently, because of the de minimis exemption periods, EPA proposes to find that the Ohio revisions constitute a relaxation of the existing Ohio opacity rules.[20]

5.4 Tennessee

In Tennessee, compliance with the State's visible emissions standard is to be determined periodically by a certified observer making opacity readings in accordance with EPA Method 9. However, under Tennessee Department of Environment and Conservation (TDEC) Rule 1200-3-5-.03(5), the Technical Secretary may agree to the use of continuous opacity monitors (COMS) for determining compliance with the opacity limit after specifying in the appropriate permit the operational availability and quality assurance requirements for the COMS. For fuel burning sources, TDEC Rule 1200-3-20-.06(5)(a) defines a de minimis period for opacity in excess of the applicable opacity limit to be equal to 2 percent of facility operating time per calendar quarter, excluding periods of start-up, shutdown, and excused malfunctions. Statistically, this analysis

[19] Exempt opacity values are specifically defined in Ohio Rule 3745-17-07(A).
[20] 70 Fed. Reg. 36901 (June 27, 2005).

shows that for a fixed opacity percentage limit, COMS with a 2 percent de minimis exemption is likely to be more stringent than the same numerical percentage limit when enforced with periodic Method 9 observations and no de minimis periods.

6. COMS Data from MCC Kiln No. 2 Should Not be Assumed Credible Evidence of PM Violations.

Wyoming regulations currently allow the use of "credible evidence" or information to determine compliance but only if such evidence or information is relevant to whether the source would have been in compliance with applicable emission limits *if* the appropriate compliance test had been performed. MCC's permits specify that compliance with the PM emission limit for Kiln No. 2 be determined annually by conducting a stack test using EPA Reference Method 5.

In my opinion, there is no basis for concluding *a priori* that the CAM Plan results for MCC Kiln No. 2 can be used to determine compliance with the PM mass emission limit (expressed in the units of pounds/hour) given that the required compliance test method is EPA Reference Method 5. I believe that the variability exhibited between simultaneous COMS opacity readings and Method 5 mass emission rate determinations that were used to establish the CAM graph is so large that there is no way to say with certainty that CAM graph and Method 5 would yield equivalent results for any particular compliance tests. Data used to develop the CAM Plan for Kiln No. 2 are shown in Table 1. A plot of the data along with a "best fit" linear regression line is shown as Figure 1. A plot of the data along with a least squares regression line and the 95 percent tolerance intervals is shown as Figure 2. The tolerance intervals are constructed such that we have 95 percent confidence that 75 percent of the data points will lie within the pair of tolerance intervals. There are at least three significant technical problems with using the MCC Kiln No. 2 CAM Graph to predict non- compliance with the PM emission limit.

Table 1. MCC Kiln No. 2 CAM Data

Date	Time	Opacity, %	PM Emissions, lbs/hr
2/8/2000	07:37 – 08:41	17.6	27.36
2/8/2000	11:13 – 12:18	14.8	22.92
8/21/2001	11:22 – 12:24	4.1	6.80
8/28/2001	13:09 – 14:14	5.0	8.90
4/24/2002	14:02 – 15:08	8.6	20.75
4/24/2002	16:03 – 17:09	8.9	20.95
4/25/2002	11:06 – 12:14	21.0	28.10
8/30/2002	09:15 – 10:18	7.2	18.00
8/30/2002	11:22 – 12:24	6.0	14.80

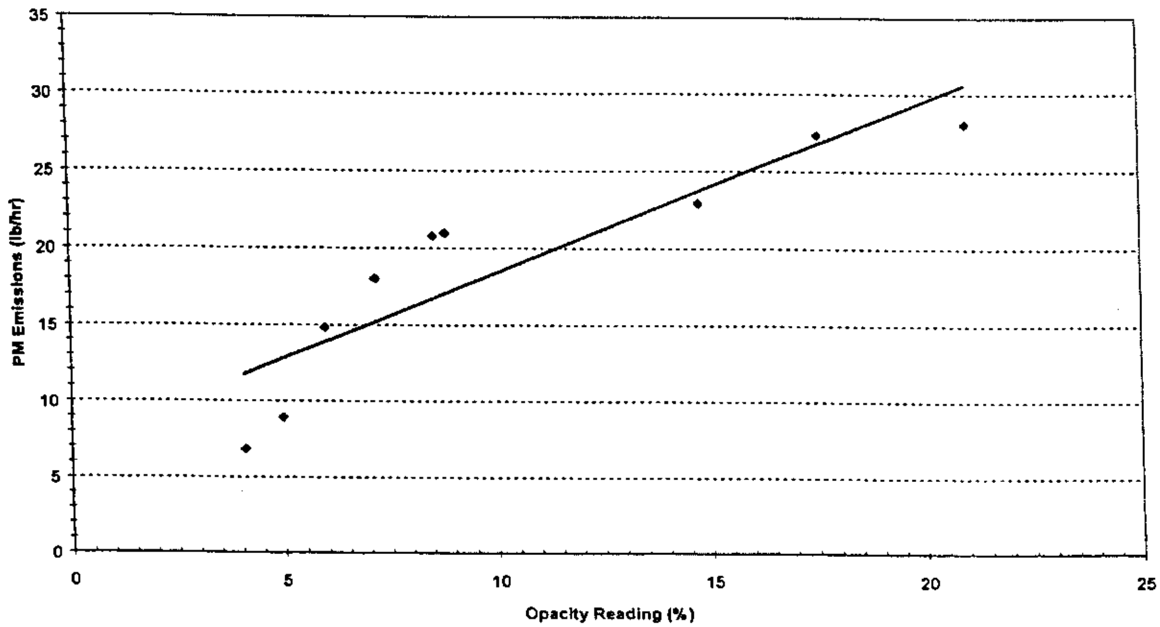

Figure 1
Basic CAM Graph for MCC Kiln No. 2

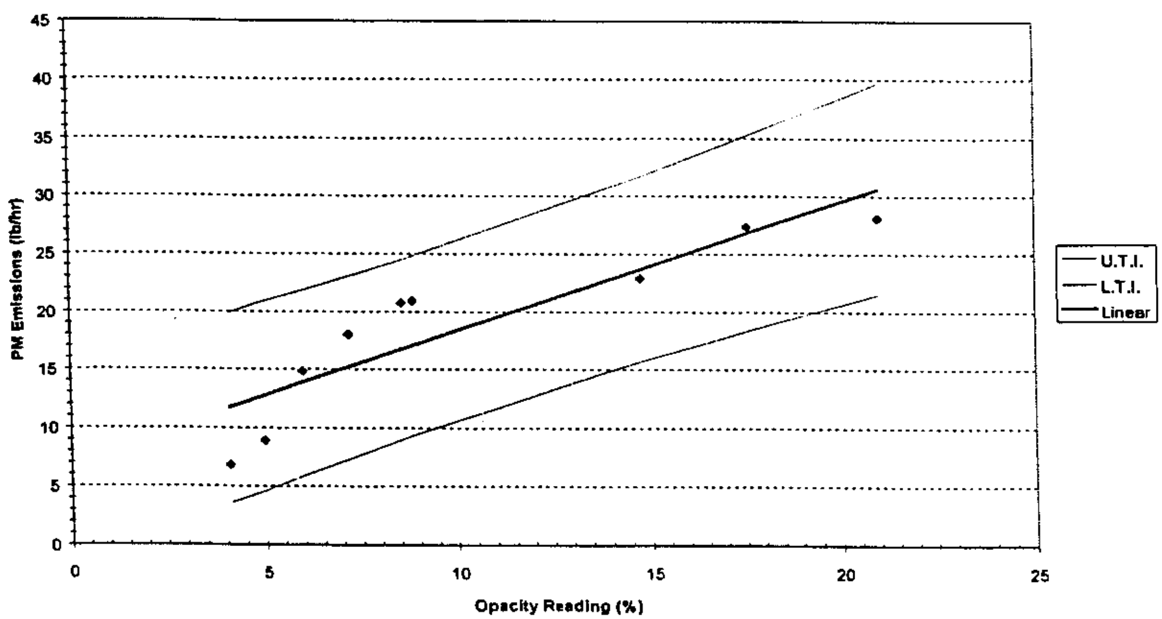

Figure 2
CAM Graph for MCC Kiln No. 2 with Tolerance Intervals

1. As the CAM Graphs clearly show, there is a tremendous amount of variability in the relationship between opacity and hourly PM emission rates. As Figure 2 shows, at 20 percent opacity, we know that (at the 95 percent confidence level) 75 percent of the time, the measured PM emission rate will be between 20.5 and 38.5 pounds per hour. Although the central estimate (regression line) 29.5 lb/hr, 50 percent of the time emissions would actually be higher and 50 percent of the time actual emissions would be lower.
2. The next technical issue is data range. The highest reported data pair is: 21 percent opacity and PM emissions equal to 28.1 lb/hr. To assert non-compliance with the Kiln No.2 PM emission limit of 29.3 lb/hr requires extrapolation beyond the limits of the data. Extrapolation beyond the limits of the data introduces uncertainly in the opacity - PM relationship that is simply unknown.
3. Lastly, there is the issue of averaging time. Compliance with the PM emission limit for MCC Kiln No. 2 must be based on the arithmetic average of three EPA Method 5 sampling runs. EPA Method 5 requires a minimum sampling time of 60 minutes. When the time required for sampling port changes along with the time to clean-up one run and to prepare for the next run are considered, the effective average time must be on the order of 6 hours.

To further document the averaging time issue, I reviewed five PM emission test reports for MCC Kiln No.2, which covered a period from February 2000 through April 2002. These five reports described a total of seven EPA Method 5 compliance tests for MCC Kiln No. 2. The elapsed time (i.e., time for the start of the first run until the completion of the third run) for the seven PM compliance tests ranged from 4 hours and 16 minutes to 5 hours and 11 minutes. The average elapsed time for a EPA Method 5 compliance test was 4 hours and 45 minutes – almost 5 hours.

MCC's compliance testing requirement is consistent with EPA regulations. For example, 40 CFR 60.8, which is a general provision applicable to facilities subject to EPA's new source performance standards, states that compliance is based on the arithmetic mean of three sampling runs using the applicable test method. Section 60.8 also states that performance (compliance) tests are to be conducted under representative operating conditions. Operations during periods of startup, shutdown, and malfunction shall not constitute representative conditions for the purpose of a performance test nor shall emissions in excess of the applicable limit be considered a violation. Likewise, 40 CFR 63.7, which is a general provision applicable to facilities subject to EPA's maximum achievable control technology (MACT) standards, contains almost identical language with respect to (1) basing compliance on the arithmetic mean of three runs and (2) conducting the performance test under representative operating conditions.

7. Conclusions

Based on the foregoing, and in addition to my conclusions contained herein, it is my opinion that:

- The MCC Kiln No. 2 opacity limit, if enforced with COMS data, would be considerably more stringent than the limit when verified with periodic Method 9 readings.
- A 20 percent opacity limit, if enforced with COMS data without de minimis relief periods, is more stringent than a 20 percent opacity limit enforced with Method 9.
- Consistent with EPA's High Priority Violations policy, Wyoming DEQ takes no enforcement action if opacity exceedances measured by COMS occur less than 5 percent of the operating time in any one quarter or less than 3 percent of operating time in two consecutive quarters.
- COMS data are best used for their originally intended purpose – to verify proper operation and maintenance of PM control technology.
- COMS, like all other measurement systems, are subject to inaccuracies, breakdowns and malfunctions. Typical operating problems (e.g., dirty optics and misalignment) tend to produce COMS readings that are biased high.
- By itself, the CAM graph for the MCC Kiln No. 2 cannot be used as credible evidence to show non-compliance with the PM emission standard.

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF WYOMING

Biodiversity Conservation Alliance and Sierra Club,	)	
Plaintiffs,	)	Case No. 04CV 361-B
v.	)	
Mountain Cement Company,	)	
Defendant.	)	

EXPERT WITNESS REPORT OF ROGER BROWER ON BEHALF OF THE DEFENDANT MOUNTAIN CEMENT COMPANY

Defendant Mountain Cement Company files the attached expert witness report of Roger Brower, and pursuant to the Court's Unopposed Motion and Stipulated Order Extending Deadlines in Amended Order On Initial Pretrial Conference.

DATED this 15th day of August, 2005.

EXHIBIT
D

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CERTIFICATE OF SERVICE

I, Jason M. Tangeman, certify that a copy of the above and foregoing pleading was served on Plaintiffs by placing a copy of the same in the U.S. Mail, postage prepaid and addressed as follows on August 15th, 2005:

Reed Zars
Attorney at Law
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Jason M. Tangeman

UNITED STATES DISTRICT COURT
DISTRICT OF WYOMING

BIODIVERSITY CONSERVATION ALLIANCE and SIERRA CLUB Plantiffs, v. MOUNTAIN CEMENT COMPANY, Defendant.	)	Case No. 04CV 361-B

EXPERT REPORT OF ROGER BROWER
ON BEHALF OF DEFENDANT

1. Summary of Opinions and Estimations

- Electrostatic Precipitators (ESP) are recognized by the industry and air quality regulators as appropriate, effective particulate matter (PM) control devices for Portland cement kilns. In the 1999 timeframe, the U.S. EPA reported that ESPs were used to control particulate matter emissions from about half of the non-hazardous waste burning Portland cement kilns in the United States.

- Air quality regulators have determined, and continue to determine, that ESPs are "Best Available Control Technology" for particulate matter from Portland cement kilns in permitting major sources. In fact, a preheater/precalciner cement kiln at Florida Rock Industries' Newberry Plant in Alachua County, Florida recently has been permitted with an ESP to control particulate matter from its inline kiln/raw mill.

- U.S. EPA considers ESPs and fabric filters (baghouses) as appropriate and basically equivalent performing technologies for control of particulate matter from cement kilns.

- Replacing an ESP with a fabric filter system would not be efficient or cost-effective because both technologies provide comparable expected control of particulate matter.

- Mountain Cement Company's Operating Permit requires stack tests using EPA Method 5 to ensure compliance with permitted particulate emissions limits. Stack tests at Mountain Cement Kiln #2 confirm that the Kiln #2 ESP can and does effectively control particulate matter emissions to below the permit allowable limits.

- Stack tests have been performed by Mountain Cement to determine the PM emissions from the Kiln #2 stack. All stack test results for Kiln #2 are below the permit limits for particulate matter.

- The U.S. EPA has found that the Laramie, Wyoming area and the Albany County, Wyoming area have had and continue to have air quality levels that meet the National Air Quality Standards (NAAQS) for PM_{10}, particulate matter with a diameter of 10 microns or less. The NAAQS are set to protect public health and welfare. There is an annual standard and a 24-hr standard for PM_{10}. For decades the particulate matter air quality has been monitored in Laramie, Wyoming. Monitoring is comprehensive, being enhanced by two additional monitoring sites near Mountain Cement. The ambient air quality monitoring data in Laramie Wyoming and near the Mountain Cement facility has demonstrated compliance with the annual PM_{10} NAAQS. Only one daily value above the 150 $\mu g/m^3$ 24-hr PM_{10} NAAQS concentration level has been reported (concentration of 233 $\mu g/m^3$ on December 16, 2002) over the six years (1999 through 2004) of monitoring data reviewed. The 24-hr PM_{10} NAAQS allows one exceedance of the prescribed air concentration per year.

- With respect to the one daily measured value above the 24-hr PM_{10} NAAQS concentration level (on December 16, 2002), the Wyoming Department of Environmental Quality (Wyoming DEQ) indicated that this measured level was due to a high wind event. Under U.S. EPA policy, data during uncontrollable natural events, such as high wind events, should be discounted in decisions regarding the attainment of the PM_{10} NAAQS. On December 16, 2002, Mountain Cement's excess opacity values for Kiln #2 were just above 20% opacity and infrequent: only five 6-minute periods during the day had excess opacity values, and these values were only between 20% and 30% opacity (there were no excess opacity values for the clinker cooler on this day). PM_{10} monitoring data have indicated ambient concentration levels below the PM_{10} NAAQS level even on days when Mountain Cement's excess opacity values were higher and more frequent.

- Based on my review of the PM_{10} ambient monitoring data and Mountain Cement Company's excess opacity reports for Kiln #2, it is my opinion that the stack emissions associated with excess opacity have not caused a violation of the PM_{10}

NAAQS, and that these emissions have not threatened the PM_{10} air quality in the Laramie Wyoming area.

- Mountain Cement follows the WAQSR Chapter 7, Section 3 Compliance Assurance Monitoring (CAM) Requirements given in Operating Permit 31-098. Mountain Cement's CAM plan, like all CAM plans, is established to provide effective monitoring and performance evaluation of pollution control equipment.

2. Bases for Opinions and Estimations

- In its analysis for developing the National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement industry, the U.S. EPA found that "All kiln exhaust gases are controlled at the existing plants by either [fabric filters] or ESPs to limit PM emissions." (*National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry; Proposed Rule*, 63FR14192, March 24, 1998).

- In its response to comments on the proposed Portland Cement NESHAP, the U.S. EPA stated that "….it should be noted that half of the [non-hazardous waste burning] cement kilns are controlled by ESPs, the other half by fabric filters…" (*Portland Cement NESHAP Response to Comments Document*, page 134, August 16, 1999).

- In its defense of the PM Maximum Achievable Control Technology (MACT) standards, the U.S. EPA stated, in the Portland Cement NESHAP final rule, that "EPA evaluated the MACT floor technology for both existing and new sources at proposal and determined that the MACT floor technology is properly designed and operated [fabric filters] and ESPs. Commenters provided no data to support that an alternative design or technology represents a floor that could achieve a lower level of PM emissions on a consistent basis." (*National Emission Standards for Hazardous Air Pollutants for Source Categories; Portland Cement Manufacturing Industry; Final Rule*, 63FR31916, June 14, 1999).

- A search of the U.S. EPA's RACT/BACT/LAER Clearinghouse database (http://cfpub.epa.gov/RBLC/htm/bl02.cfm) was performed to identify permit and Best Available Control Technology determinations of ESPs for control of PM emissions from cement kilns. According to U.S. EPA, the RBLC database contains "case-specific information on the "Best Available" air pollution technologies that have been required to reduce the emission of air pollutants from stationary sources." For permits issued since 1991, other than Mountain Cement Company, the RBLC database indicated that ESPs were permitted at cement kilns at the following cement manufacturers: Lehigh Cement Company (Iowa, Permit # 17-01-005), Alamo Cement Company (Texas, permit # PSD-TX-145 M1), Lone Star Industries, Inc. (Indiana, permit # 133-10159), Lone Star Industries (Indiana, permit # 133-5886-0002-3241), Florida Rock Industries (Florida, permit # PSD-

FL-228), Roanoke Cement Company (Virginia, permit # 20232), Holnam, Inc. (Utah, permit # DAQE-558-92), and Carolina's Cement Company (North Carolina, permit # 7300). RBLC database search results are provided in **Attachment A.**

- According to U.S. EPA (40CFR52.21) "*Best available control technology* means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant."

- The Florida Department of Environmental Protection (DEP) currently is in the process of issuing a permit to Florida Rock Industries (FRI) for a new preheater/precalciner cement kiln with in-line raw mill (Line 2) controlled by an ESP at FRI's Newberry Plant in Alachua County Florida. The draft permit (0010087-013-AC, PSD-FL-350) is presented in **Attachment B**. The permit requires an ESP to control PM emissions from the in-line kiln/raw mill, based on a BACT determination made by the Florida DEP (see permit Section III. Emission Units Specific Conditions, Subsection B, State Requirements, Operational Requirements, 14. Emissions Unit 010).

- In its BACT determination for the Florida Rock Industries proposed Line 2 at FRI's Newberry Plant, the Florida DEP found that "Common control devices for controlling emissions of particulate matter at cement plants are fabric filters (baghouses) and electrostatic precipitators (ESPs). Baghouses and ESPs are generally considered equivalent for particulate control. Both types of devices can achieve removal efficiencies of over 99%. ESPs and baghouses are used extensively as control devices at cement plants." In addition, the Florida DEP confirms our RBLC database search results in that "A review of the BACT/LAER Clearinghouse shows that baghouses and ESPs are widely used to control particulate matter from process emission units at cement plants. Both offer an essentially equivalent level of control and are commonly accepted as BACT." (*Best Available Control Technology Determination (BACT), Florida Rock Industries, Inc. Newberry Plant, PSD-FL-350, Air Permit 0010087-013-AC, Alachua County*, page BD-15, see **Attachment C**)

- In its analysis for developing the National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement industry, the U.S. EPA found that "The data ... show equivalent performance can be expected from [fabric filters] and ESPs, and that neither technology offers a clear advantage." (*National Emission Standards for Hazardous Air Pollutants; Proposed Standards for*

Hazardous Air Pollutants for the Portland Cement Manufacturing Industry; Proposed Rule, 63FR14199, March 24, 1998).

- Because ESPs and fabric filter systems show equivalent performance, it would be speculative to assert significantly higher particulate control from a fabric filter system. Even assuming 20 tons of additional particulate control from a fabric filter system, the cost (estimated to be about $35,000/ton) of controlling this assumed incremental amount of PM by using a fabric filter system in place of an ESP would be greater than levels that have been deemed cost effective by regulators. This estimate assumes a capital cost of $3,500,000, an annual operating and maintenance cost of $300,000, and a capital recovery factor of 0.1147.

- Facility-specific Permit Condition F8 (of Mountain Cement Company Operating Permit 31-098) requires stack tests using EPA Method 5 to show compliance with the Kiln #2 stack particulate emissions specified in condition F5.

- Stack tests have been performed by Mountain Cement to determine the PM emissions from the Kiln #2 stack. Stack test reports listed in **Attachment D** have been reviewed. All stack test results for Kiln #2 are below the permit limits for particulate matter.

- Two of the three more recent stack tests performed over the nine months from November 25, 2003 to September 3, 2004 had kiln production data recorded in the stack test reports. These production data are used to confirm that the stack test was performed at near plant capacity. Results from the two Kiln #2 stack tests assessed here are found in: *Source Emissions Testing Report for Mountain Cement Company, Laramie, Wyoming, Kiln #2 Particulate Matter, Test date: September 3, 2004* (performed by Air Pollution Testing, Inc.) and *Kiln #2 Particulate Test Report, Mountain Cement Company, Laramie, Wyoming* (dated January 2, 2004, performed by Retec).

- Based on results from PM stack tests performed on September 3, 2004 and November 25, 2003 (see **Attachment E**), the measured Kiln #2 PM emission rates were 5.94 lb/hr (0.0028 gr/acf) and 5.50 lb/hr (0.0024 gr/acf). These measured emission rates are well below the PM permit limit of 29.30 lb/hr (Operating Permit 31-098). The kiln feed rates reported during the stack testing were 98.5 tph and 90 tph, respectively. Based on the Kiln #2 modification application dated April 6, 1987 (i.e., 97.66 tph feed relates to 1500 tpd clinker production; see page 3 of April 6, 1987 application), these reported kiln feed rates are representative of Kiln #2 at near full production.

- Based on results from PM stack tests performed on September 3, 2004 and November 25, 2003 (see **Attachment E**), the measured flowrates ranged from 241,995 acfm to 246,762 acfm for the September 3, 2004 stack test, and the measured flowrates ranged from 261,029 acfm to 272,858 acfm for the November

25, 2003 stack test. These measured flowrates, near full production, are not that different from the original ESP design value (246,000 acfm, see letter from MikroPul Corporation to Monolith Cement Company, dated November 30, 1978).

- According to the Wyoming Air Quality Standards and Regulations (WAQSR Chapter 2, Section 2), the PM_{10} AAQS is defined as "***PM_{10}:*** The ambient air standards for PM_{10} particulate matter are:

    (i) 50 micrograms per cubic meter--annual arithmetic mean;
    (ii) 150 micrograms per cubic meter--24-hour average concentration with not more than one expected exceedence per year.
    (iii) Attainment of the annual and 24-hour standards is determined in accordance with Appendix K of 40 CFR part 50."

  These State standards are equivalent to the National Ambient Air Quality Standards.

- The Clean Air Act, which was last amended in 1990, requires U.S. EPA to set National Ambient Air Quality Standards (NAAQS) for wide-spread pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings. The Clean Air Act requires periodic review of the science upon which the standards are based and the standards themselves.

  EPA has set NAAQS for six principal pollutants; one is PM_{10}, particulate matter with a diameter of 10 microns or less. Particles less than 10 microns in diameter pose a health concern because they can be inhaled into and accumulate in the respiratory system. Both an annual and a 24-hr NAAQS have been set by U.S. EPA for PM_{10}.

- The Wyoming Department of Environmental Quality reports ambient PM_{10} monitoring results for three sites in Laramie, Wyoming. One site (Site ID 56-001-006) is at 406 Ivinson, about 5 km north of Mountain Cement. Monitoring is enhanced around the Mountain Cement facility. There are two monitoring sites near Mountain Cement. One site (Site ID 56-001-0801) is about 0.5 km north of the plant, and the other site (Site ID 56-001-0800) is about 0.7 km to the east of the plant.

- The Laramie, Wyoming area has and continues to attain the PM_{10} Ambient Air Quality Standard according to U.S. EPA (http://www.epa.gov/oar/oaqps/greenbk/pncs.html#WYOMING; see **Attachment F**).

- The PM_{10} monitoring data for Laramie, Wyoming has been reviewed. A summary of the PM_{10} monitoring results for 1999 through 2004 is given in **Attachment G.** In the six years of monitoring data reviewed, there is only one daily value (on December 16, 2002) that is above the 24-hr PM_{10} NAAQS level (see **Attachment H**). The Wyoming DEQ stated in a Mountain Cement Company Facility Inspection Report (September 13, 2004 inspection, see **Attachment I**) that this measured high PM_{10} level "...most likely occurred during a high wind event." The Wyoming DEQ did not recommend any further action. In U.S. EPA's "Natural Events" policy (**Attachment J**), the EPA states that it is appropriate to "...exclude PM_{10} air quality data that are attributable to uncontrollable natural events from decisions regarding an area's attainment status." The EPA policy defines "high wind events" as a relevant natural event.

- According to the Mountain Cement quarterly report, on December 16, 2002, the opacity at Kiln #2 was greater than 20% only for 5 six-minute periods, The values ranged from 20.1% to 30.1% opacity (*Mountain Cement Company's Fourth Quarter, 2002 Excess Emissions Report*, Kiln #2 Form C, page 8, see **Attachment K**).

- Based on my review of the PM_{10} ambient monitoring data and Mountain Cement Company's excess opacity reports for Kiln #2, days having higher levels or much longer periods of excess opacity have not resulted in levels of monitored PM_{10} concentration above the 24-hr PM_{10} NAAQS level. For example, on July 25, 2002, Mountain Cement Company reported (see **Attachment L**) excess opacity values for 55 six-minute periods (5.5 cumulative hours). The opacity values ranged from 20% to 100%: 49% of the reported periods had opacities greater than or equal to 50%, 27% of the periods had opacities greater than or equal to 80%, and three periods had opacities at 100%. The winds this day were towards the monitors for the majority of the times of reported excess opacity. On this day, the two monitors near the plant measured 24-hr PM_{10} concentrations of 25 $\mu g/m^3$ and 33 ug/m3, respectively; well below the 24-hr PM10 NAAQS level of 150 $\mu g/m^3$ (U.S. EPA Air Quality System Report for 2002 for Site IDs 56-001-0801 and 56-001-0800, see **Attachment M**).

- Mountain Cement follows the WAQSR Chapter 7, Section 3 Compliance Assurance Monitoring (CAM) Requirements given in Operating Permit 31-098. The approved CAM plan is established to monitor and evaluate the operation of control measures so that the source remains in compliance with applicable requirements. This approach is consistent with EPA's intent for CAM. In the CAM Rule Preamble (October 3, 1997), EPA states that the approach in the CAM rulemaking is "...to establish monitoring for the purpose of: (1) documenting continued operation of the control measures within ranges of specified indicators of performance (such as emissions, control device parameters and process parameters) that are designed to provide a reasonable assurance of compliance with applicable requirements; (2) indicating any excursions from these ranges; and (3) responding to the data so that excursions are corrected. The

part 64 published today adopts this second approach as an appropriate approach to enhancing monitoring in the context of title V permitting for significant emission units that use control devices to achieve compliance with emission limits."

3. Qualifications and Compensation

- My resume is given in **Attachment N.**
- My fee as an expert witness is $240 per hour, and $160 per hour for travel.
- I have authored/co-authored nine technical papers in the past 10 years. References to these papers are provided in **Attachment O**.
- I have not testified as an expert in the last four years at trial or a deposition.
- I declare under penalty of perjury that the statements in this report are true and accurate to the best of my knowledge, and that the attachments to this report represent true and accurate copies of the originals.

August 13, 2005
Dated

Roger P. Brower
Roger Brower

Expert Report
of
Dale R. Jensen, CPA

Analysis of the Economic Benefits, if Any, of Alleged Noncompliance by Mountain Cement Company with Certain Environmental Regulations

In the Matter of:

Biodiversity Conservation Alliance and Sierra Club

v.

Mountain Cement Company

Civil Action No. 04CV 361-B

U.S. District Court for the District of Wyoming

Dale R. Jensen, CPA
Partner - PricewaterhouseCoopers LLP
August 15, 2005

PRICEWATERHOUSECOOPERS

EXHIBIT

E

PricewaterhouseCoopers LLP has been retained on behalf of Mountain Cement Company to analyze the economic benefits, if any, of alleged noncompliance by Mountain Cement Company with certain environmental regulations (our Services). Our Services were performed and this Expert Report was developed in accordance with our engagement letter dated April 25, 2005 and are subject to the terms and conditions included therein. Our Services were performed in accordance with Standards for Consulting Services established by the American Institute of Certified Public Accountants ("AICPA"). The procedures we performed did not constitute an examination or a review in accordance with generally accepted auditing standards or attestation standards. We did not audit or otherwise verify the information supplied to us in connection with this engagement, from whatever source. Our work was limited to the specific procedures and analysis described herein and was based only on the information made available through the date of this Expert Report. Accordingly, changes in circumstances after this date could affect the findings outlined in this Expert Report.

In preparing this Expert Report, we have considered and/or relied upon the documents listed on Attachment A. A summary of our findings is presented below.

Background of Economic Benefit

EPA's BEN model seeks to estimate the economic benefit relating to alleged noncompliance with a permit or environmental law - the financial gain obtained by a company that avoids or delays making the related environmental compliance expenditures. The economic benefit is calculated as the difference between the cash flows associated with what the company actually did, or plans to do (i.e., the delayed compliance case), and the cash flows associated with what the company allegedly should have done to comply on time (i.e., the on-time compliance case). The economic benefit represents an estimate of the amount that the company saved by not complying on time.

EPA's literature describes economic benefit as follows:

> "Economic benefit represents the financial gains that a violator accrues by delaying and/or avoiding such pollution control expenditures. Funds not spent on environmental compliance are available for other profit making activities or, alternatively, a defendant avoids the costs associated with obtaining additional funds for environmental compliance." United States Environmental Protection Agency, BEN User's Manual, p. 1-2 (September 1999).

Economic benefit calculations are dependent upon a number of variables, including the following:

A. Compliance activities – Determination of the most cost-effective activities required to achieve compliance.

B. Cost estimates – Estimates of the initial capital costs and the incremental annual operating expenses of such compliance activities.

C. Noncompliance date – The date when the alleged violation of a permit or environmental law occurred.

D. Compliance date – The date when the company achieved (or is expected to achieve) compliance with a permit or environmental law.

E. Discount rate – The interest rate used to move money backward in time.

F. Compound rate – The interest rate used to move money forward in time.

G. Inflation rate – The rate at which the estimated costs of compliance activities increase due to inflation. This rate is used to move cost estimates backward and forward in time from the cost estimate date to account for inflation.

H. Penalty payment date – The projected date at which an economic benefit amount will be paid.

I. Actual expenditures – The costs of activities incurred to address issues relating to the alleged noncompliance with a permit or environmental law.

Discount/Compound Rate

The BEN model estimates economic benefit by calculating the difference between the on-time compliance case and the delayed compliance case discounted to the noncompliance date. This amount is then brought forward to the penalty payment date at a compound rate.

The discount/compound rate in an economic benefit calculation is an estimate of either the rate of return the company earned on the funds that it allegedly should have spent on environmental compliance, or the interest rate the company would have paid to obtain funds for environmental compliance expenditures. The BEN Model default value for the discount/compound rate is a generic company's weighted average cost of capital (WACC). By using this BEN model default, the assumption is that a generic company would have invested the alleged economic benefit in its business and earned the same rate of return as the rest of its business, or that the company would have borrowed funds to finance environmental expenditures at this same rate. By utilizing this method, the BEN Model often overestimates the economic benefit of noncompliance by not using actual, company-specific economics.

If the BEN model's approach of using a company's cost of capital as the discount/compound rate is adopted, Mountain Cement Company's specific business situation must be analyzed to determine the actual incremental cost of capital it would have used to finance the environmental expenditures.

It is reasonable to assume that Mountain Cement Company (as well as any other company) would utilize the lowest cost alternative to finance environmental expenditures. Mountain Cement Company's lowest cost alternative to finance environmental expenditures is through its parent's (Eagle Materials, Inc.) bank borrowings at the prime rate, as confirmed by company personnel. Accordingly, the interest rates on Eagle Material's bank borrowings should be used as the discount/compound rate in the economic benefit calculation if the BEN model's cost of capital approach is utilized. Following is a summary of the prime rates during the period of alleged noncompliance:

Year	Rate
2000	9.2%
2001	6.9%
2002	4.7%
2003	4.1%
2004	4.3%
Average	5.8%

Assumptions

Our economic benefit calculation (using EPA's BEN model) assumes that the required compliance activity would be installing a baghouse at Mountain Cement Company's Wyoming plant, costing $3,500,000 as of June 30, 2005. Following is a summary of the inputs used in the attached calculation along with the source of those inputs:

Initial Capital Investment - Baghouse	$3,500,000	(1)
Annually Recurring Costs	$60,000	(2)
Useful Life	25	(3)
Replacement Cycles	0	(2)
Non-Compliance Date	10/22/1999	(2)
Compliance Date	11/15/2005	(1)
Discount/Compound Rate	5.8%	(2)
Inflation Rate	1.7%	(4)
Penalty Payment Date	11/15/2005	(2)
Corporate Tax Rate	34-35%	(4)

(1) Expert Report of Jonathan S. Sheffitz, the Plaintiff's economic benefit expert, in the matter of Biodiversity Conservation Alliance and Sierra Club v. Mountain Cement Company, dated June 12, 2005.

(2) Provided by Mountain Cement Company.

(3) Provided by Mountain Cement Company. We understand that the useful life of a baghouse is 50 years; however, EPA's BEN model will only allow a maximum input of 25 years.

(4) BEN model default.

In addition, we understand that the Plaintiffs allege that the number of opacity exceedances at kiln #2 at Mountain Cement Company's Wyoming plant constitute 3.14% of the time of kiln #2's operation during the time period from October 22, 1999 through March 31, 2005. This opacity exceedance percentage is based on the total amount of

time included in all six-minute intervals that the Plaintiffs claim Mountain Cement Company exceeded the 20% opacity limit from October 22, 1999 through March 31, 2005. We have not been asked to determine if these exceedances were violations of applicable permits. We have been asked to use the exceedances claimed by the Plaintiffs, without regard to whether they are in fact violations. Therefore, since the calculated economic benefit represents 100% opacity exceedance during the alleged noncompliance period, any resulting economic benefit must be multiplied by the applicable opacity exceedance percentage to calculate the actual economic benefit. The only opacity exceedance data available to us was through March 31, 2005. We reserve the right to update this report should additional data regarding later time periods become available.

Mountain Cement Company has also paid the State of Wyoming $42,500 related to this matter, which should be offset against Mountain Cement Company's economic benefit, if any.

Results

Using the inputs identified above, we ran EPA's BEN model. Following is the model's estimate of Mountain Cement Company's economic benefit of alleged noncompliance:

Total Economic Benefit (refer to Attachment B for this calculation)	$942,826
Opacity Exceedance Percentage During Alleged Noncompliance Period	3.14%
Economic Benefit of Alleged Noncompliance	$29,605
Payment to the State of Wyoming	($42,500)
Net Economic Benefit (Detriment)	($12,895)

Ability to Pay

Mr. Shefftz, the Plaintiffs' economic benefit expert, analyzed Mountain Cement Company's ability to pay based on Eagle Materials, Inc. financial information. As Mountain Cement Company owns the Wyoming plant, any ability to pay analysis should be based on its ability to pay, not its parent.

Other Information

In accordance with the Federal Rules of Civil Procedure, Rule 26(a)(2), I have enclosed as Attachment C my qualifications, including a listing of all publications I have authored within the preceding ten years (based on my best recollection). Attachment D is a description of matters for which I have testified at trial or by deposition within the preceding four years. I have also enclosed as Attachment E our hourly rates for time incurred on this matter.

This Expert Report has been prepared to analyze the economic benefits, if any, of alleged noncompliance by Mountain Cement Company with certain environmental regulations. Neither this Expert Report nor its contents may be distributed to, discussed with, or otherwise disclosed to any third party other than as required in connection with

Biodiversity Conservation Alliance and Sierra Club v. Mountain Cement Company, without PricewaterhouseCoopers' prior written consent. PricewaterhouseCoopers accepts no liability or responsibility to any third party who gains access to this Expert Report.

I reserve the right to supplement or modify my analyses, findings and opinions as necessary in response to new information, additional documentation, facts obtained through discovery, rulings issued by the Court, or as permitted by Rule 26(e)(1) of the Federal Rules of Civil Procedure.

Attachments